Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	1.320	2	736	6,531	----	------	------	Sub. P-1
2	Reservoir	0.458	2	764	6,531	1	217.09	1,578	Infiltration Chambers
3	Diversion1	0.458	2	764	6,531	2	------	------	Exfiltration
4	Diversion2	0.000	2	710	0	2	------	------	Overflow
6	SCS Runoff	0.128	2	738	720	----	------	------	Sub. P-2
7	SCS Runoff	0.020	2	752	291	----	------	------	Sub. P-3
8	Diversion1	0.010	2	740	268	7	------	------	Infiltration
9	Diversion2	0.010	2	752	23	7	------	------	Overflow
11	SCS Runoff	0.046	2	752	688	----	------	------	Sub. P-4
13	SCS Runoff	0.423	2	724	1,468	----	------	------	Roof Runoff
14	Reservoir	0.000	2	622	0	13	220.29	352	Roof Drywell

Worksheet 2: Runoff curve number and runoff **SM-4051A**

Project: 111 Summer Street By WJH Date 5/11/2016

Location: Acton, MA Checked _____ Date _____

Circle one: Present [Developed] Subcatchment P-1

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
-	Impervious-Pavement	98			0.29	28.26
A	Open Space - Good Condition	39			0.72	27.89
A	Woods - Good Condition	30			0.10	2.95
				Totals =	1.10	59.09

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{59.09}{1.10} = 53.64$; Use CN = 53.6

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.1	4.5	6.4
Runoff, Q..... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.19	0.67	1.64
Runoff, Q.....	cf	751	2691	6554

D-2 (210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-4051A**

Project: 111 Summer Street By WJH Date 5/11/2016

Location: Acton, MA Checked _____ Date _____

Circle one: Present [Developed]
Circle one: [Tc] Tt through subarea

Subcatchment P-1

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Woods			
2. Mannings roughness coeff., n (table 3-1)			0.6			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.02			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.29			0.29

Shallow concentrated Flow		Segment ID	B-C	C-D		
7. Surface Description (paved or unpaved)			UNPAVED	PAVED		
8. Flow Length, L		ft	48	87		
9. Watercourse slope, s		ft/ft	0.14	0.035		
10. Average Velocity, V (figure 3-1)		ft/s	6.04	3.80		
11. Tt = L / 3600V	Compute Tt	hr	0.00	0.01		0.01

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.30
min 17.8

(210-VI-TR-55, Second Ed., June 1986)

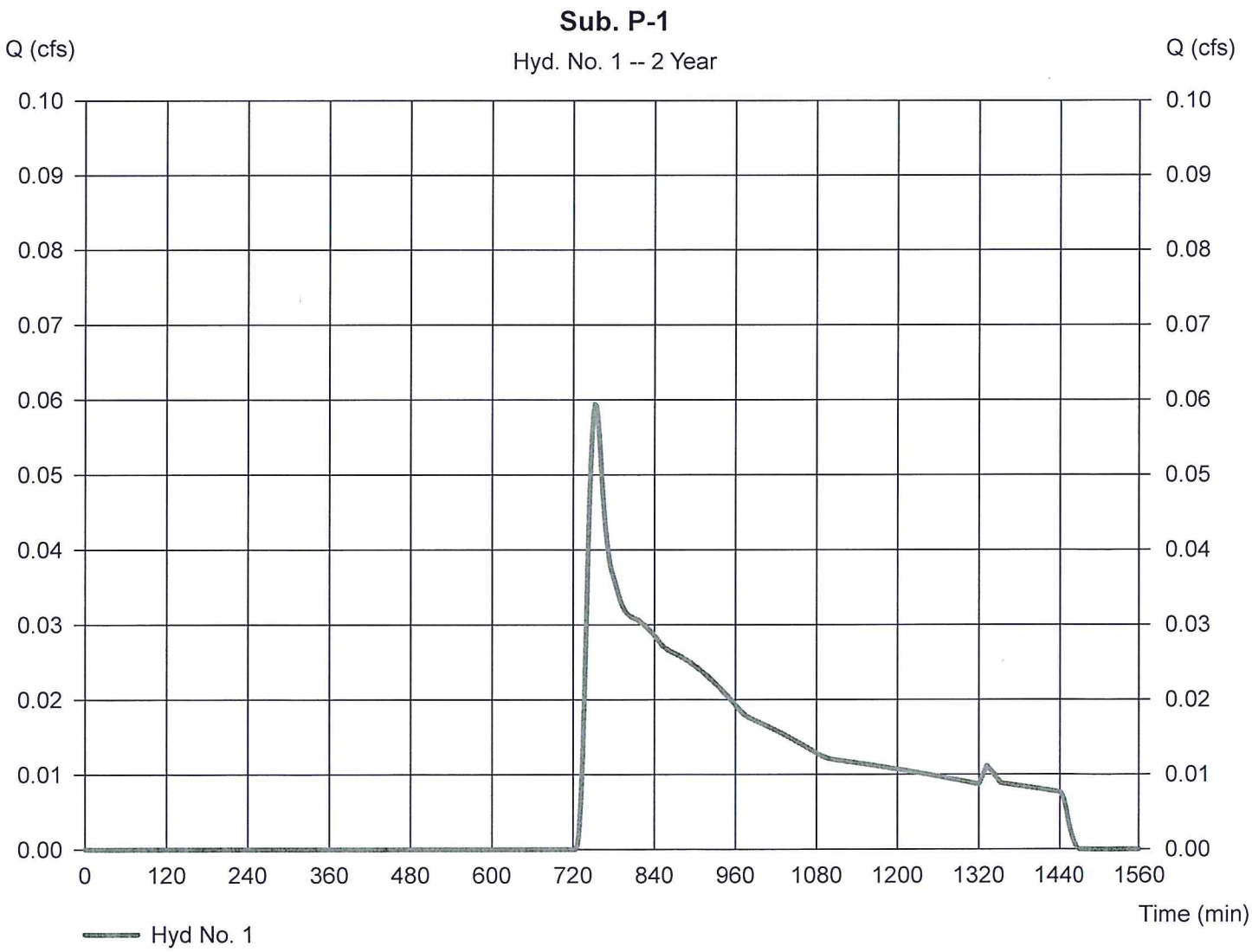
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 1

Sub. P-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.059 cfs
Storm frequency	= 2 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 746 cuft
Drainage area	= 1.100 ac	Curve number	= 53.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17.80 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



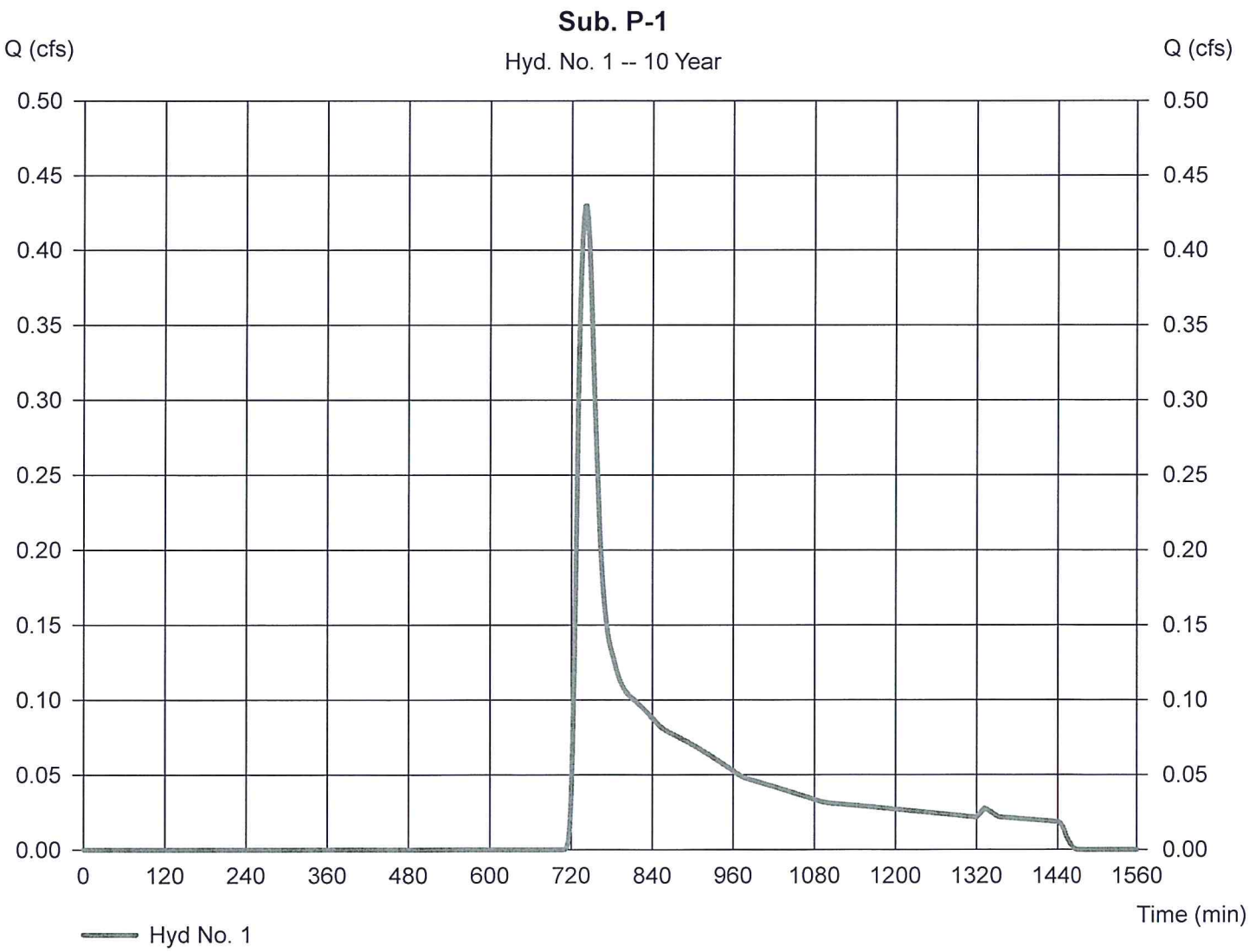
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 1

Sub. P-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.430 cfs
Storm frequency	= 10 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 2,679 cuft
Drainage area	= 1.100 ac	Curve number	= 53.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17.80 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



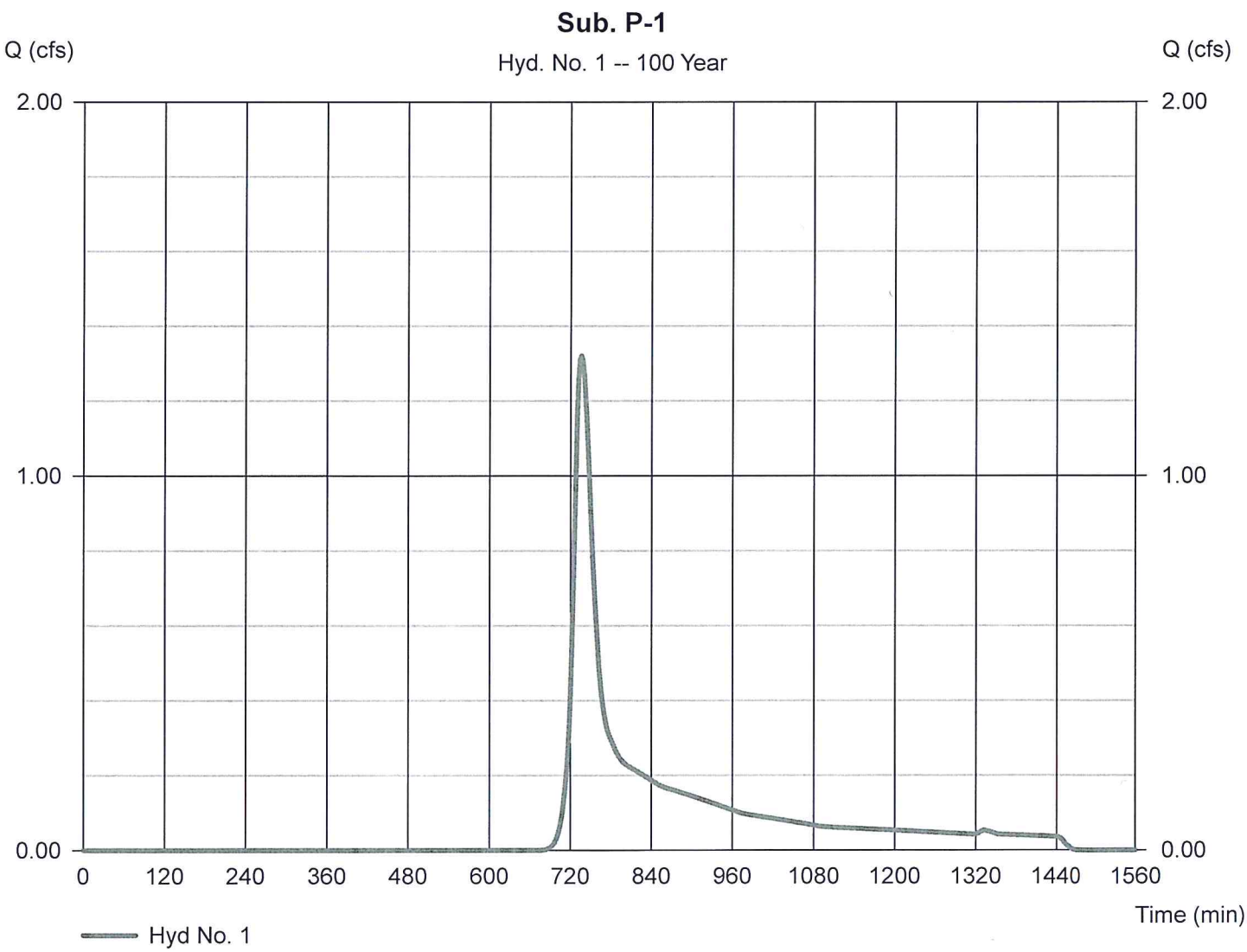
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 1

Sub. P-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.320 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 6,531 cuft
Drainage area	= 1.100 ac	Curve number	= 53.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17.80 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

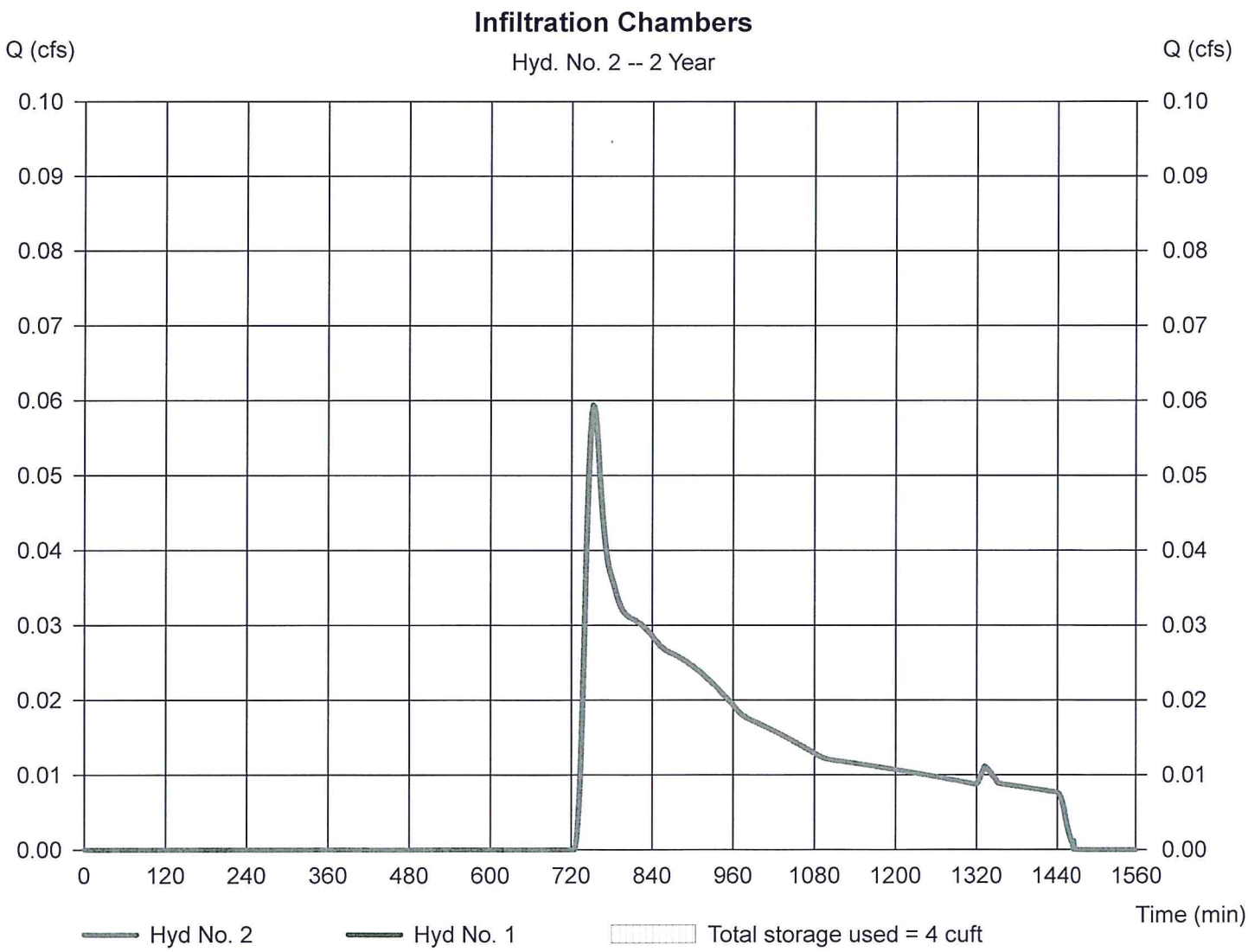
Hydraflow Hydrographs by Intelisolve v9.2 | Wednesday, May 11, 2016

Hyd. No. 2

Infiltration Chambers

Hydrograph type	= Reservoir	Peak discharge	= 0.059 cfs
Storm frequency	= 2 yrs	Time to peak	= 754 min
Time interval	= 2 min	Hyd. volume	= 746 cuft
Inflow hyd. No.	= 1 - Sub. P-1	Max. Elevation	= 214.01 ft
Reservoir name	= Subsurface Infiltration	Max. Storage	= 4 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

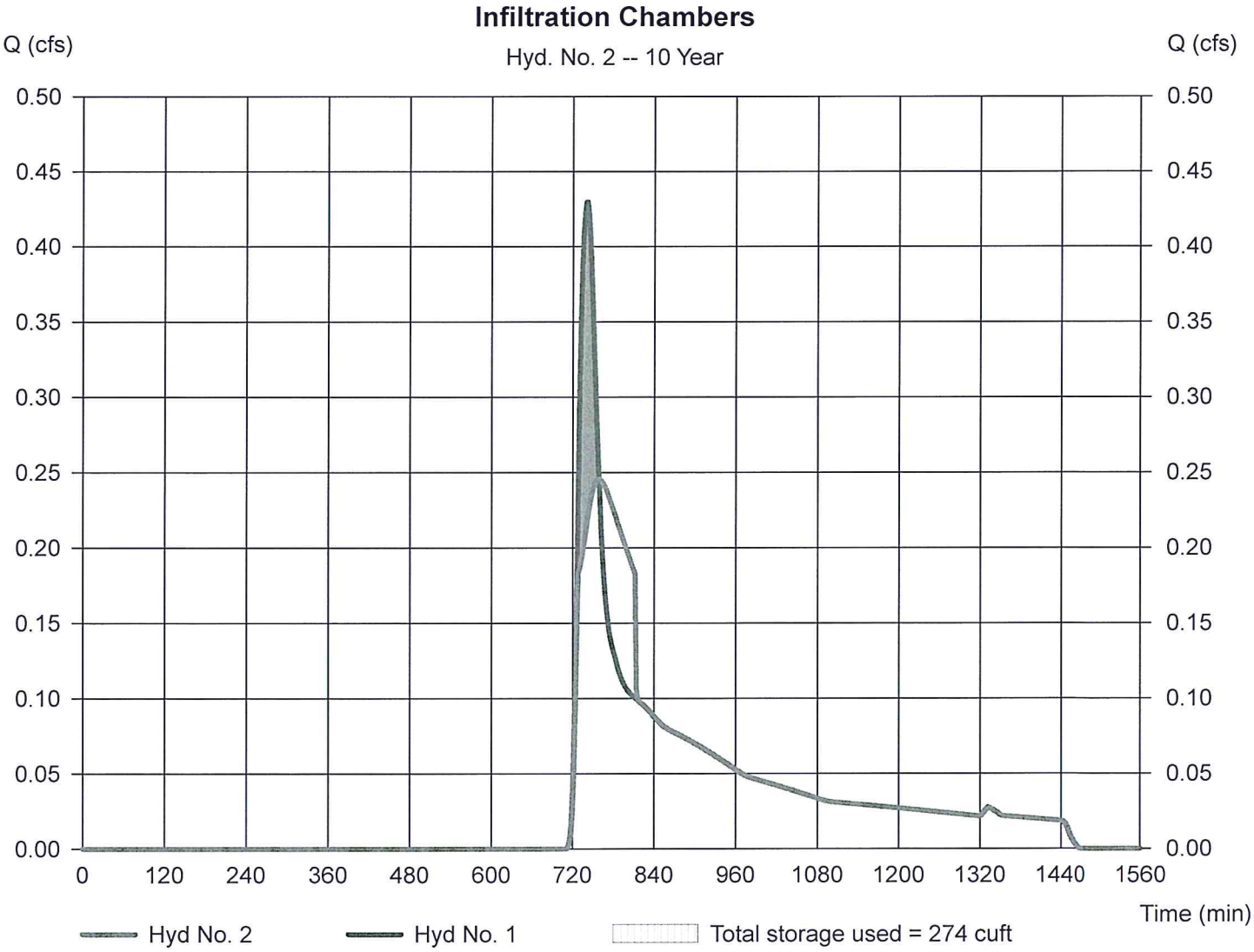
Hydraflow Hydrographs by Intelisolve v9.2 | Wednesday, May 11, 2016

Hyd. No. 2

Infiltration Chambers

Hydrograph type	= Reservoir	Peak discharge	= 0.246 cfs
Storm frequency	= 10 yrs	Time to peak	= 758 min
Time interval	= 2 min	Hyd. volume	= 2,679 cuft
Inflow hyd. No.	= 1 - Sub. P-1	Max. Elevation	= 214.73 ft
Reservoir name	= Subsurface Infiltration	Max. Storage	= 274 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

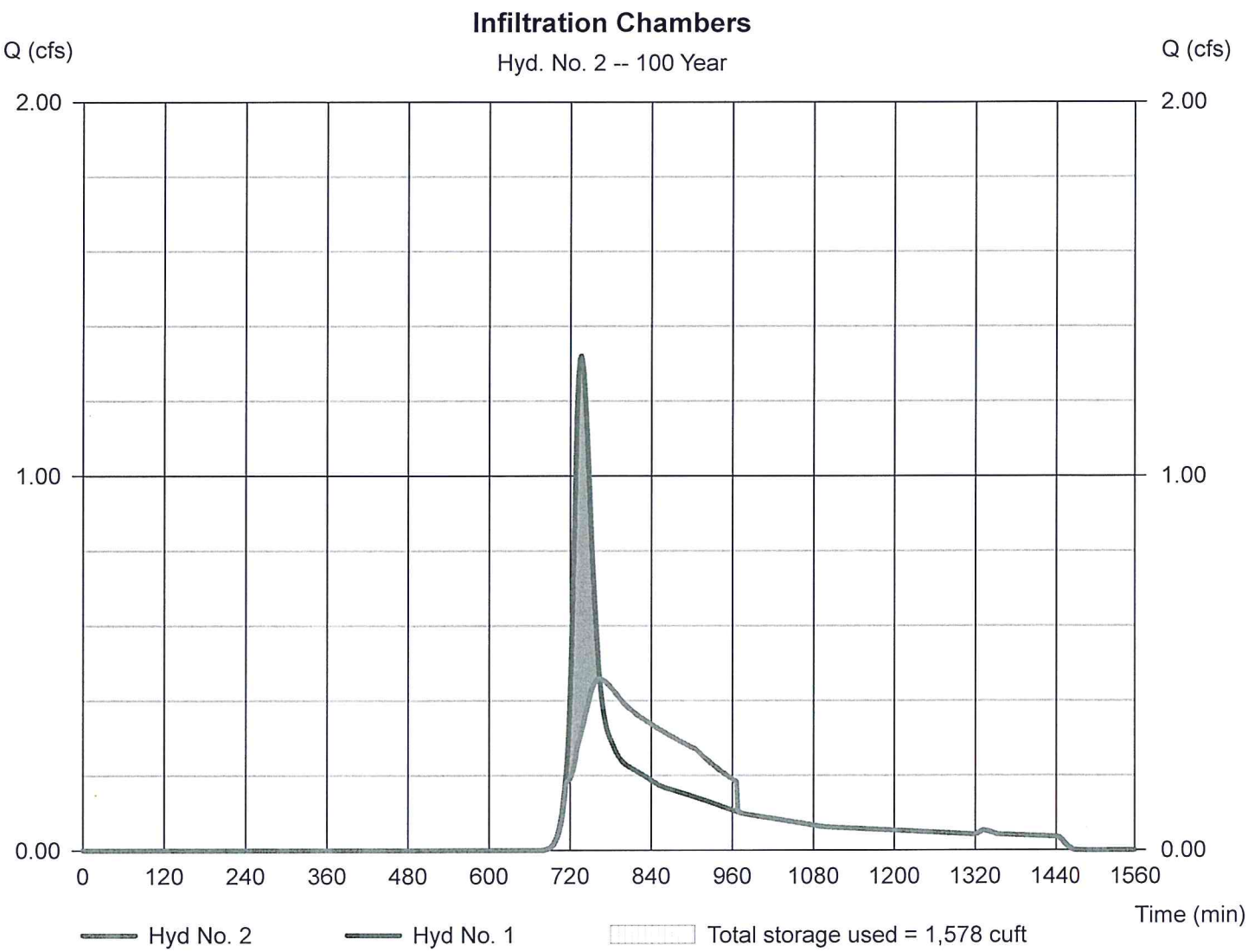
Hydraflow Hydrographs by Intelisolve v9.2 | Wednesday, May 11, 2016

Hyd. No. 2

Infiltration Chambers

Hydrograph type	= Reservoir	Peak discharge	= 0.458 cfs
Storm frequency	= 100 yrs	Time to peak	= 764 min
Time interval	= 2 min	Hyd. volume	= 6,531 cuft
Inflow hyd. No.	= 1 - Sub. P-1	Max. Elevation	= 217.09 ft
Reservoir name	= Subsurface Infiltration	Max. Storage	= 1,578 cuft

Storage Indication method used. Outflow includes exfiltration.



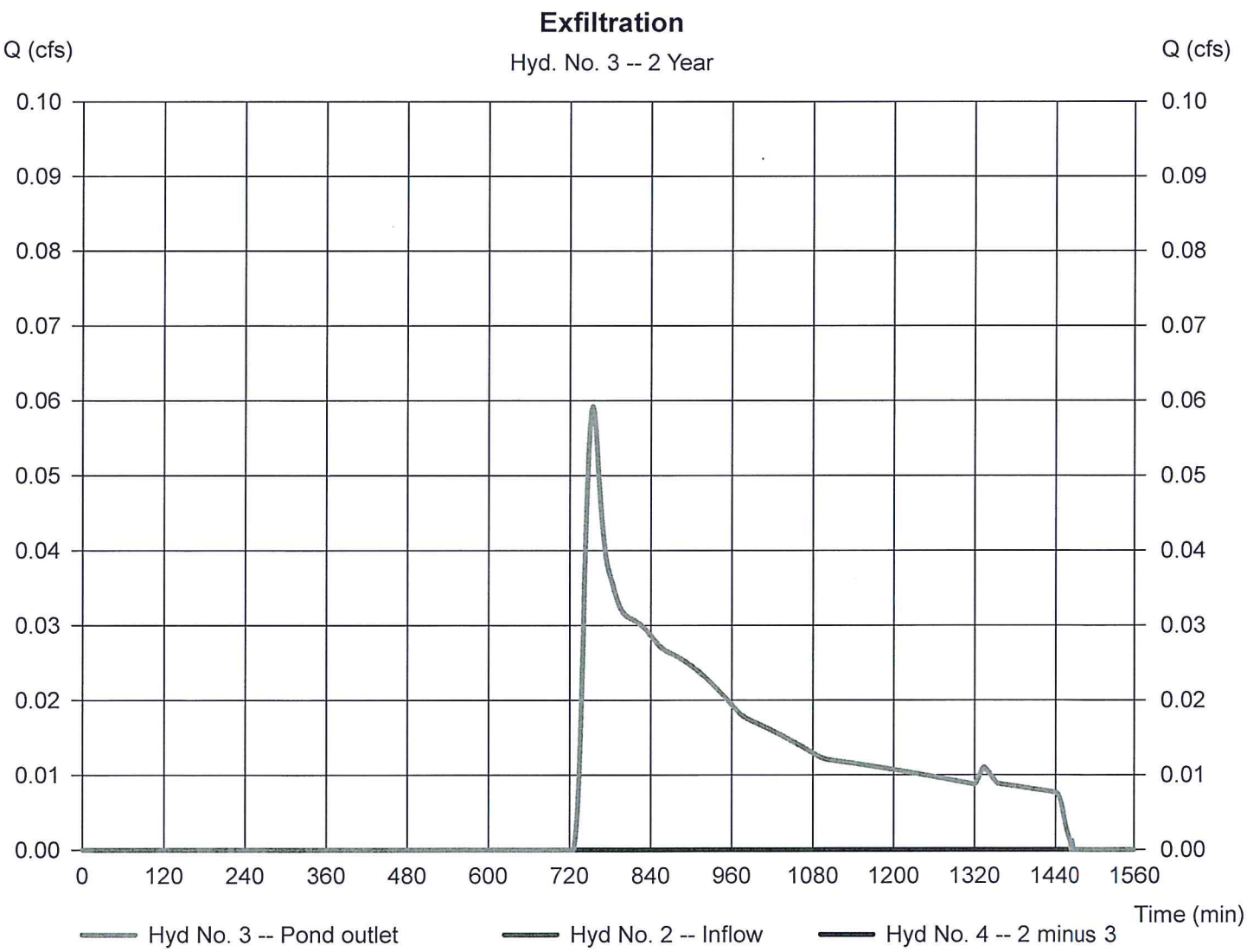
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 3

Exfiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.059 cfs
Storm frequency	= 2 yrs	Time to peak	= 754 min
Time interval	= 2 min	Hyd. volume	= 746 cuft
Inflow hydrograph	= 2 - Infiltration Chambers	2nd diverted hyd.	= 4
Diversion method	= Pond - Subsurface Infiltration	Pond structure	= Exfiltration



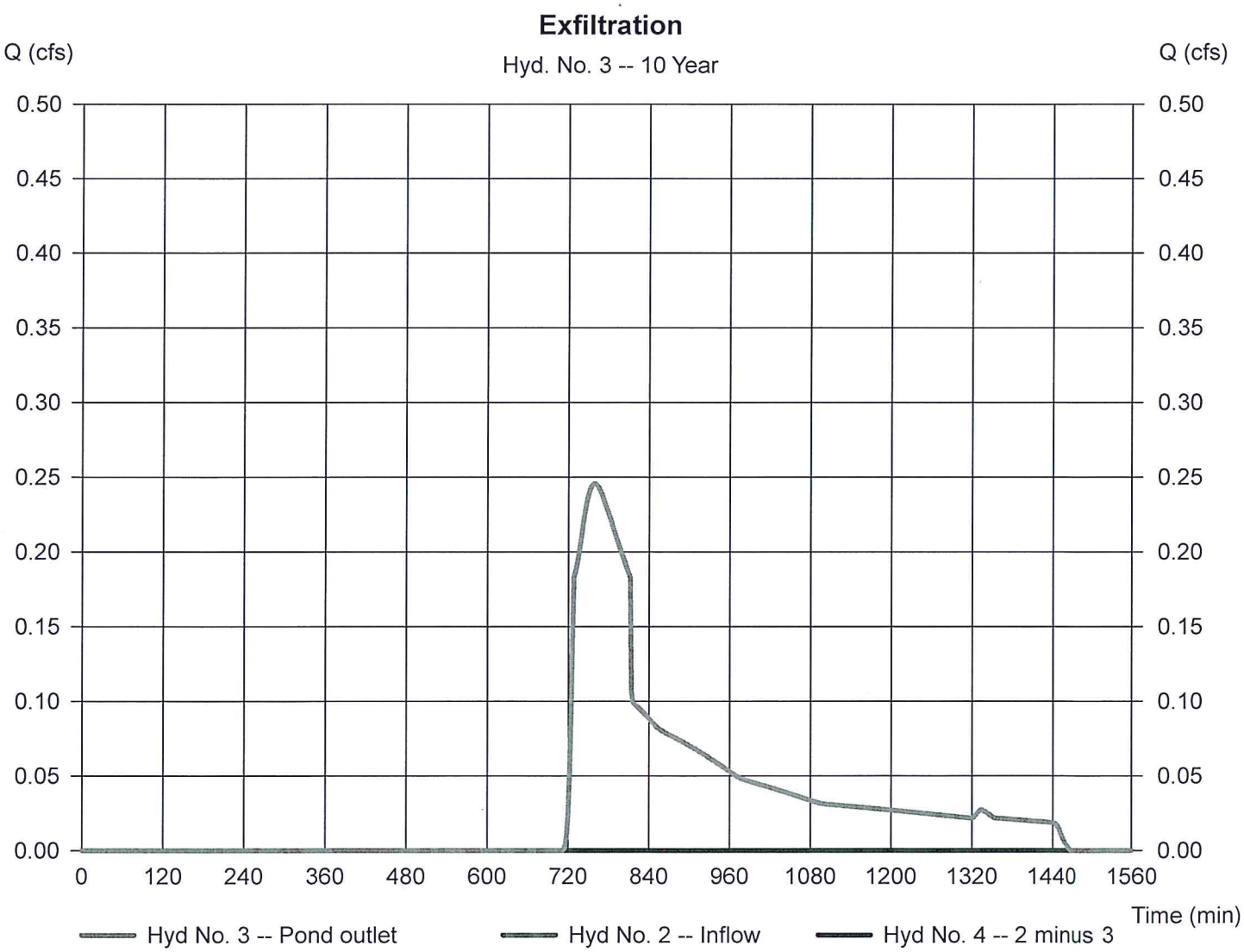
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 3

Exfiltration

Hydrograph type	=	Diversion1	Peak discharge	=	0.246 cfs
Storm frequency	=	10 yrs	Time to peak	=	758 min
Time interval	=	2 min	Hyd. volume	=	2,679 cuft
Inflow hydrograph	=	2 - Infiltration Chambers	2nd diverted hyd.	=	4
Diversion method	=	Pond - Subsurface Infiltration	Pond structure	=	Exfiltration



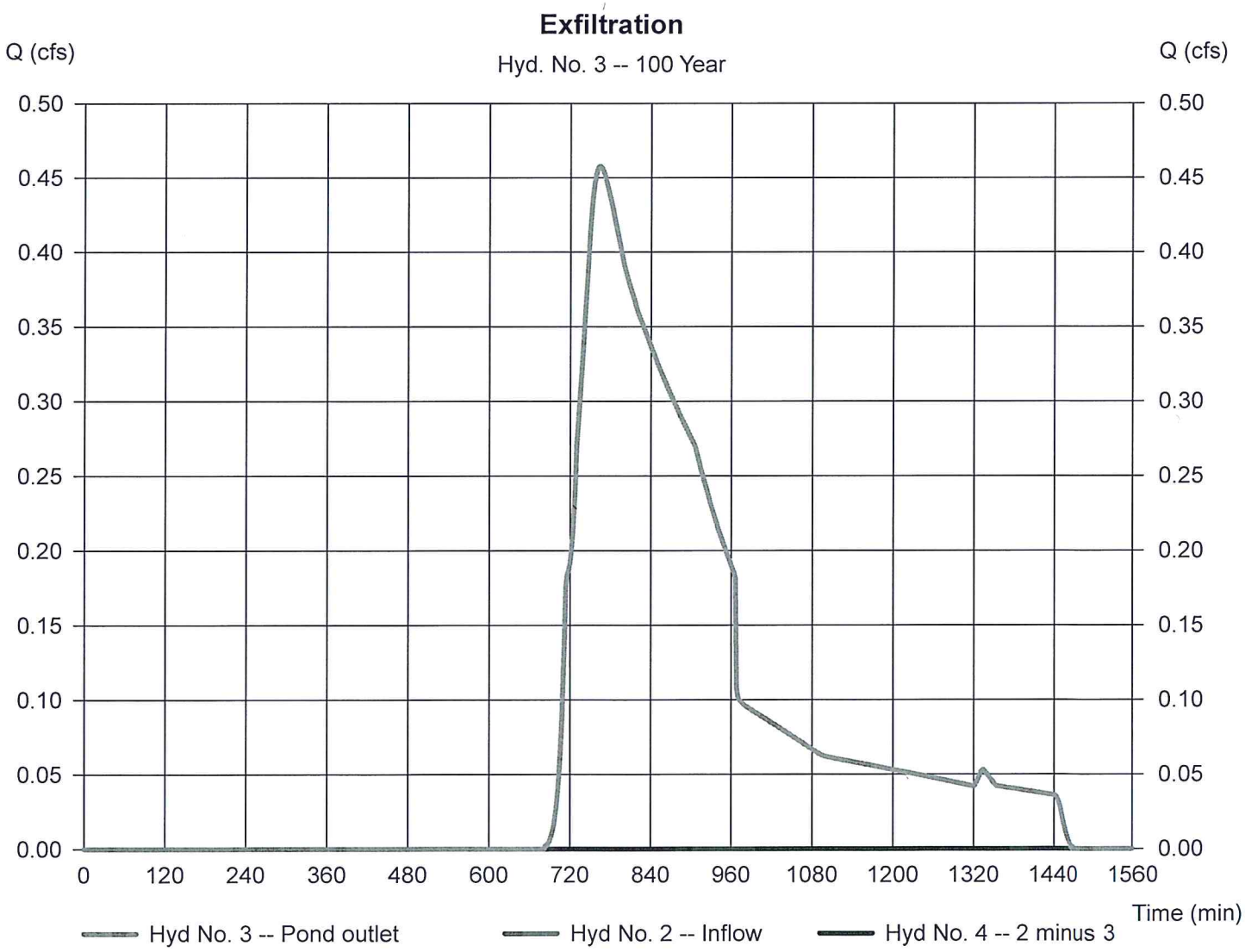
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 3

Exfiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.458 cfs
Storm frequency	= 100 yrs	Time to peak	= 764 min
Time interval	= 2 min	Hyd. volume	= 6,531 cuft
Inflow hydrograph	= 2 - Infiltration Chambers	2nd diverted hyd.	= 4
Diversion method	= Pond - Subsurface Infiltration	Pond structure	= Exfiltration



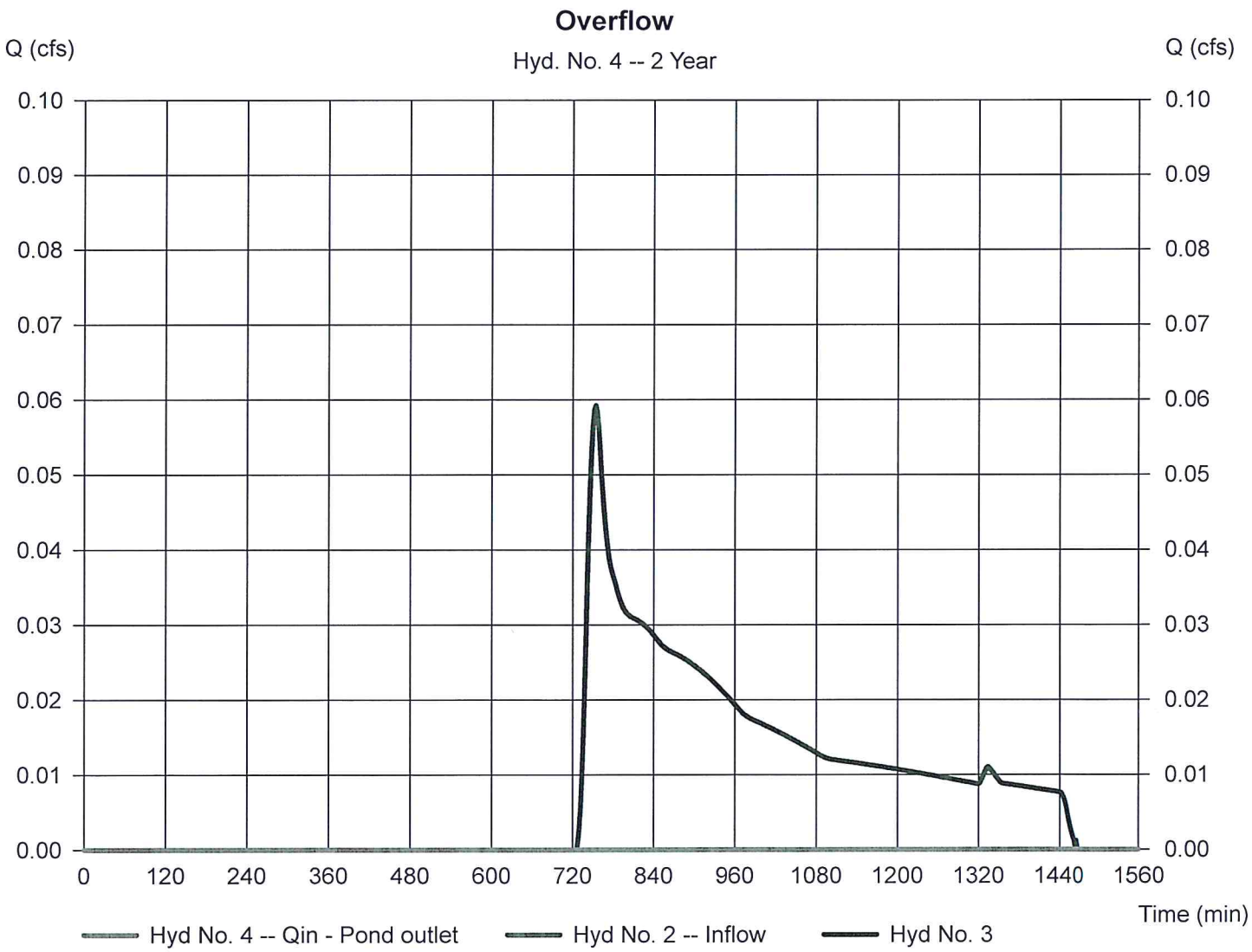
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Wednesday, May 11, 2016

Hyd. No. 4

Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 762 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 2 - Infiltration Chambers	2nd diverted hyd.	= 3
Diversion method	= Pond - Subsurface Infiltration	Pond structure	= Exfiltration



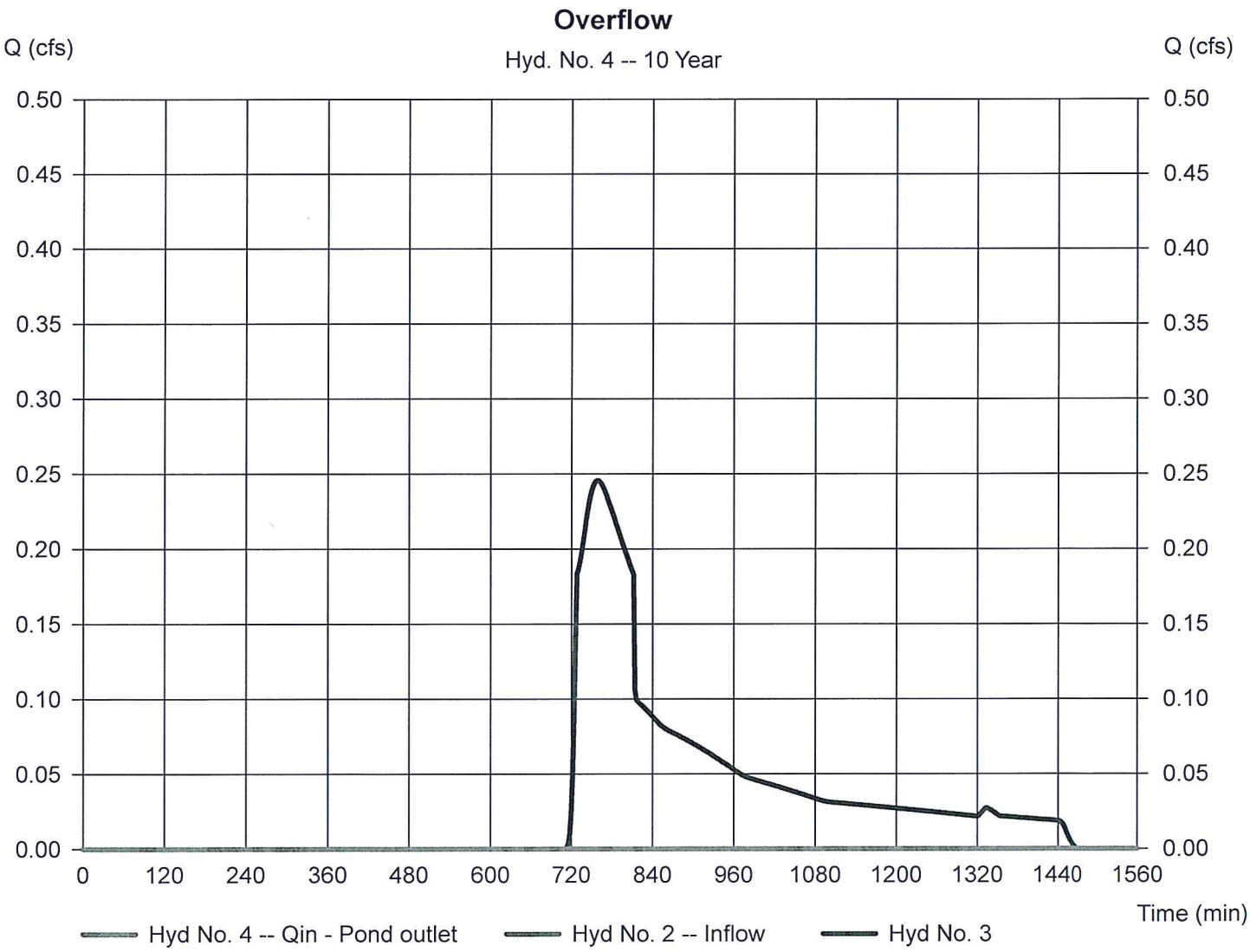
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Wednesday, May 11, 2016

Hyd. No. 4

Overflow

Hydrograph type	=	Diversion2	Peak discharge	=	0.000 cfs
Storm frequency	=	10 yrs	Time to peak	=	824 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hydrograph	=	2 - Infiltration Chambers	2nd diverted hyd.	=	3
Diversion method	=	Pond - Subsurface Infiltration	Pond structure	=	Exfiltration



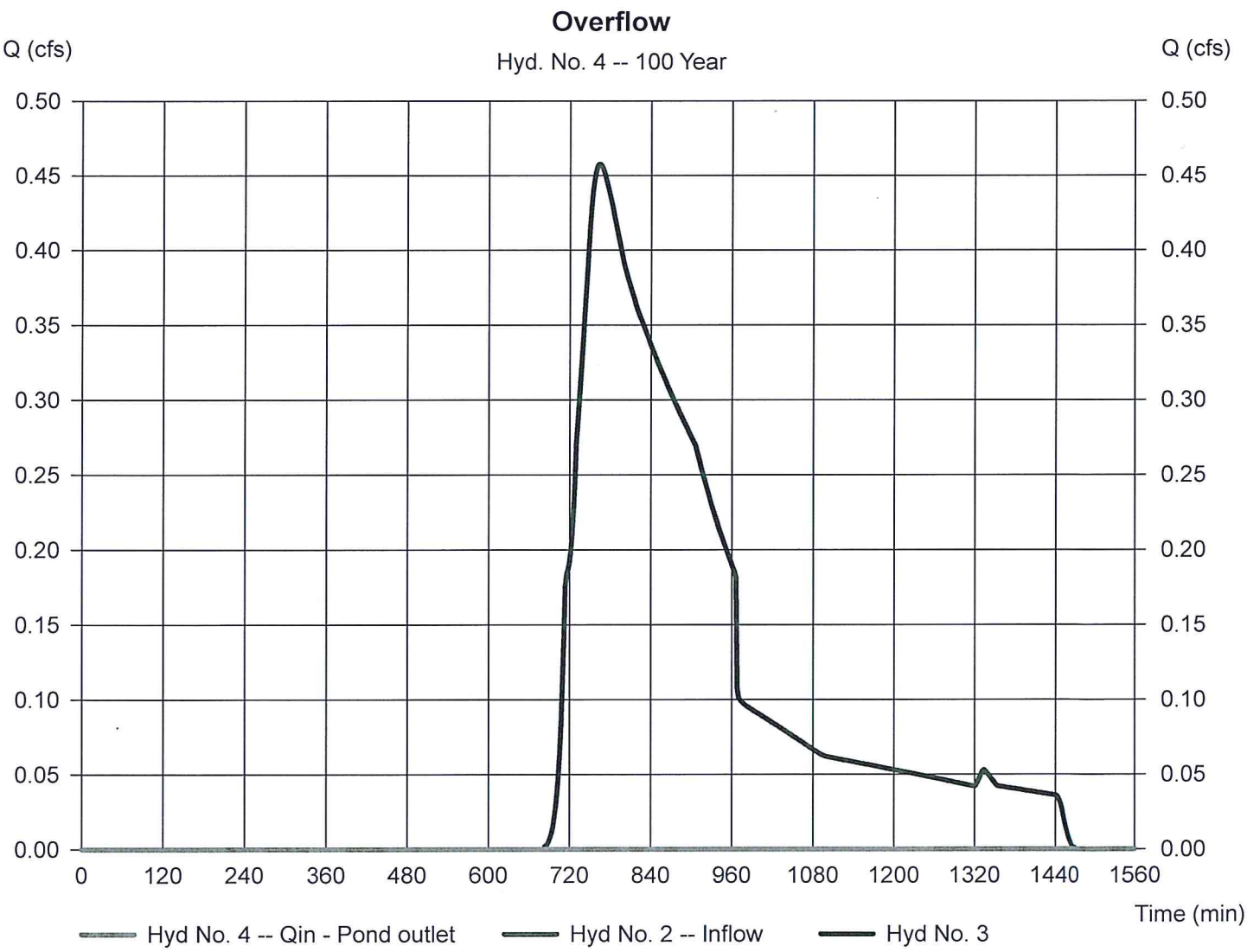
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 4

Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 710 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 2 - Infiltration Chambers	2nd diverted hyd.	= 3
Diversion method	= Pond - Subsurface Infiltration	Pond structure	= Exfiltration



Worksheet 2: Runoff curve number and runoff SM-4051A

Project: 111 Summer Street By WJH Date 5/11/2016

Location: Acton, MA Checked _____ Date _____

Circle one: Present [Developed] Subcatchment P-2

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
-	Impervious-Pavement	98			0.00	0.37
-	Impervious-Roof Runoff	98			0.02	2.38
A	Open Space - Good Condition	39			0.12	4.83
A	Woods - Good Condition	30			0.02	0.56
				Totals =	0.17	8.14

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{8.14}{0.17} = 47.71$; Use CN = 47.7

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.1	4.5	6.4
Runoff, Q..... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.07	0.40	1.17
Runoff, Q.....	cf	43	249	723

D-2 (210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-4051A**

Project: 111 Summer Street By WJH Date 5/11/2016

Location: Acton, MA Checked _____ Date _____

Circle one: Present | Developed Subcatchment P-2

Circle one: Tc | Tt through subarea _____

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Woods			
2. Mannings roughness coeff., n (table 3-1)			0.6			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.02			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.29			0.29

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			UNPAVED			
8. Flow Length, L		ft	78			
9. Watercourse slope, s		ft/ft	0.013			
10. Average Velocity, V (figure 3-1)		ft/s	1.84			
11. Tt = L / 3600V	Compute Tt	hr	0.01			0.01

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.30
min 18.0

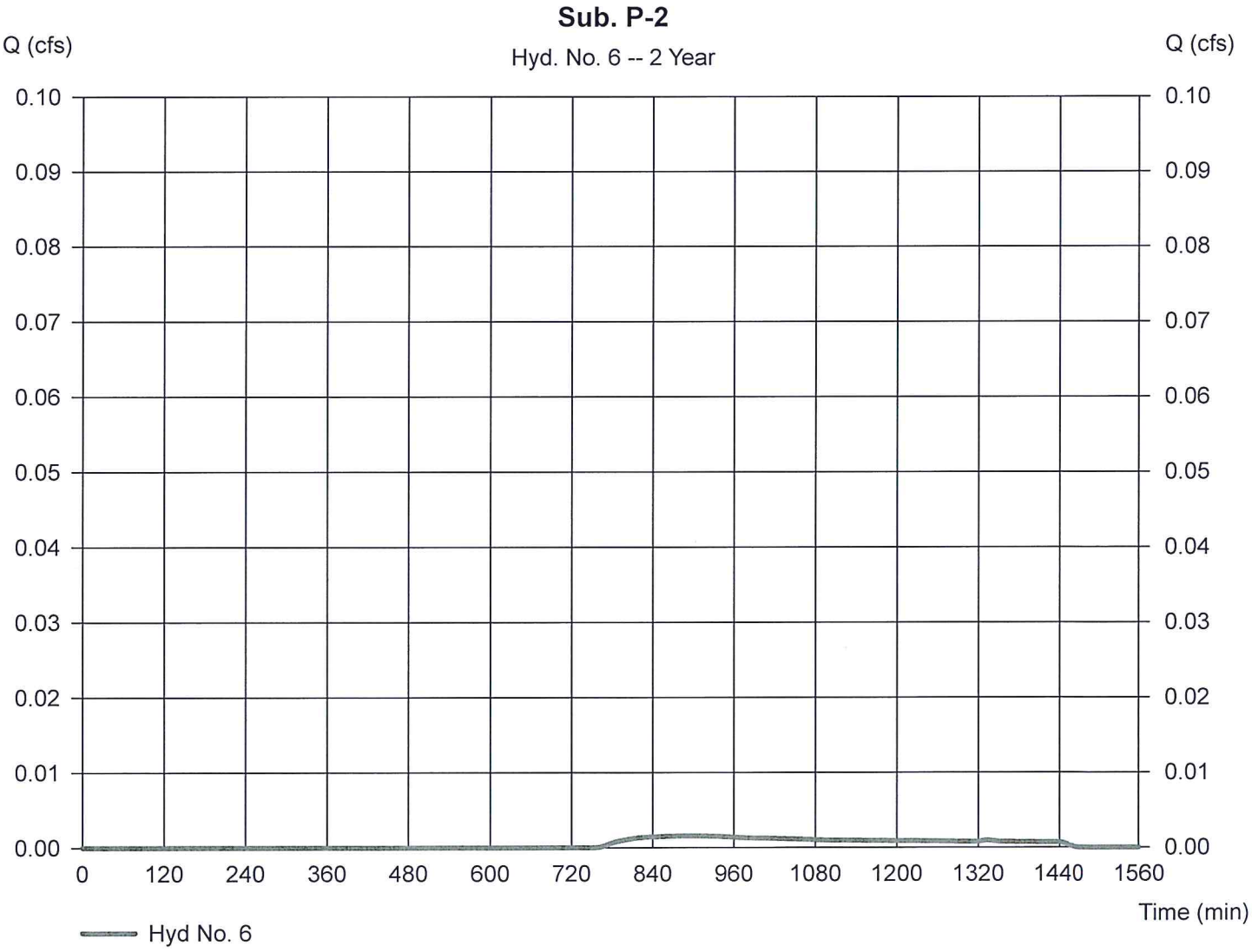
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 6

Sub. P-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.002 cfs
Storm frequency	= 2 yrs	Time to peak	= 898 min
Time interval	= 2 min	Hyd. volume	= 43 cuft
Drainage area	= 0.170 ac	Curve number	= 47.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 18.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



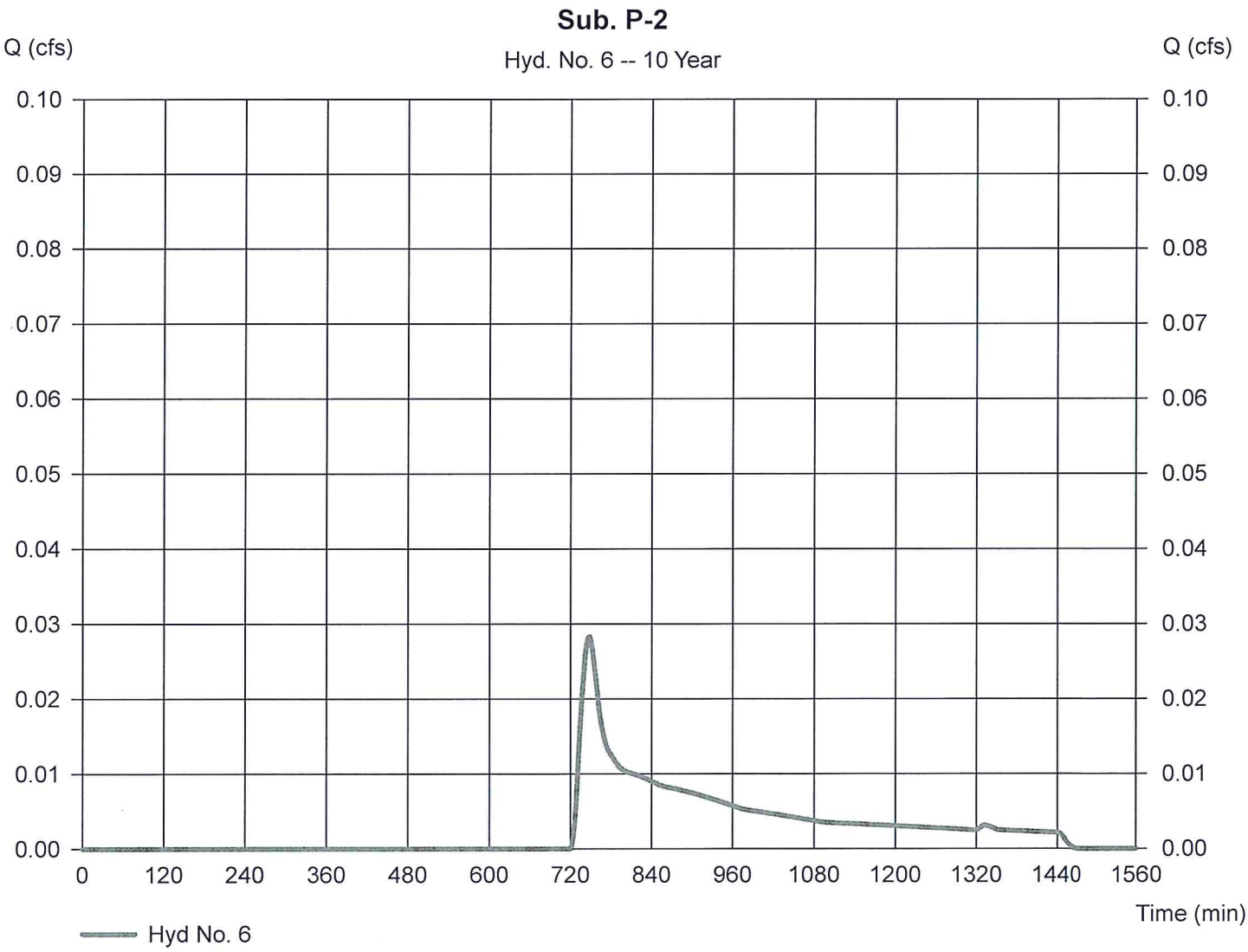
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 6

Sub. P-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.028 cfs
Storm frequency	= 10 yrs	Time to peak	= 748 min
Time interval	= 2 min	Hyd. volume	= 247 cuft
Drainage area	= 0.170 ac	Curve number	= 47.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 18.00 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



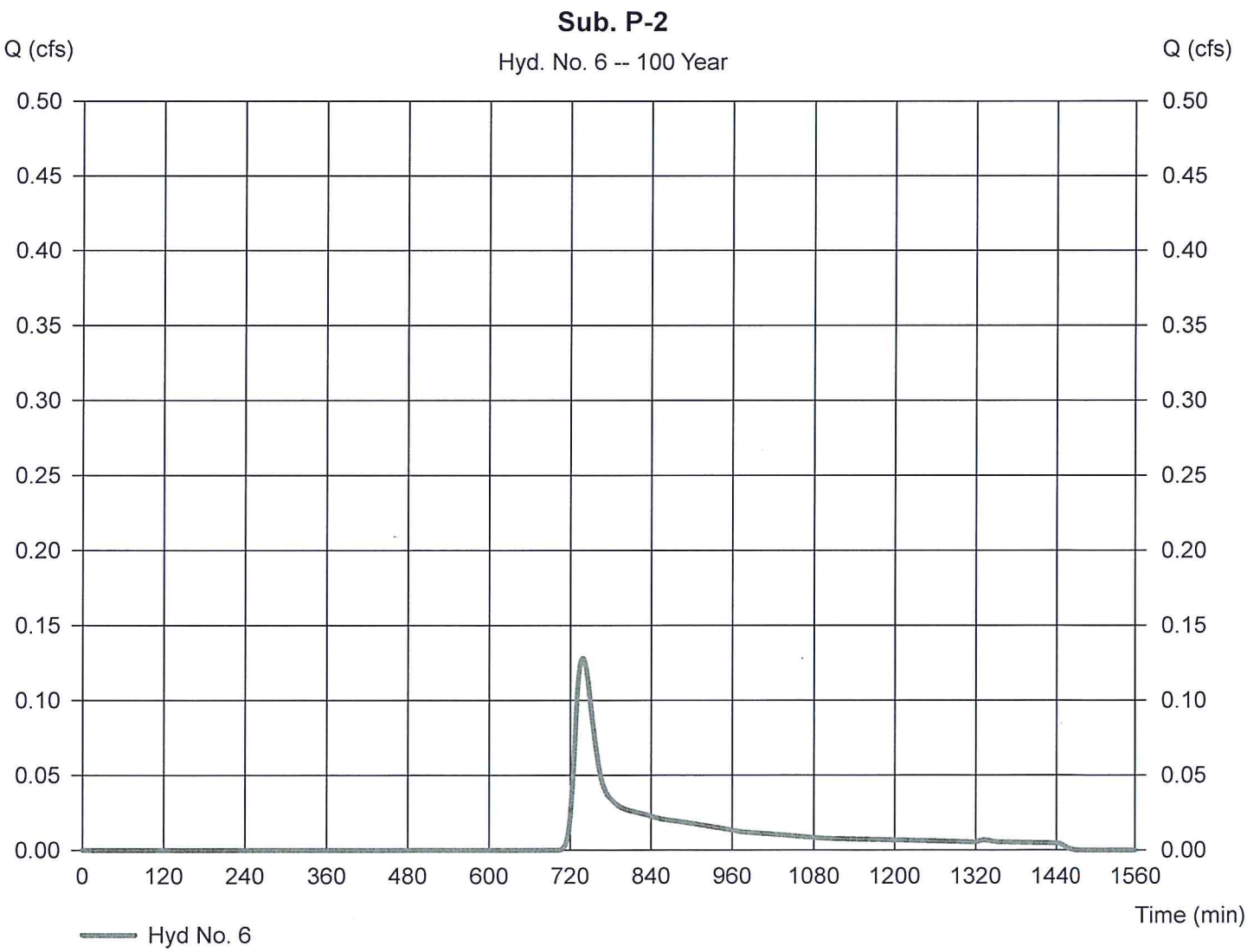
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 6

Sub. P-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.128 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 720 cuft
Drainage area	= 0.170 ac	Curve number	= 47.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 18.00 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Worksheet 2: Runoff curve number and runoff **SM-4051A**

Project: 111 Summer Street By WJH Date 5/11/2016

Location: Acton, MA Checked _____ Date _____

Circle one: Present [Developed] Subcatchment P-3

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
-	Impervious-Pavement	98			0.00	0.00
A	Open Space - Good Condition	39			0.13	5.24
A	Woods - Good Condition	30			0.12	3.47
				Totals =	0.25	8.71

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{8.71}{0.25} = 34.83$; Use CN = 34.8

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.1	4.5	6.4
Runoff, Q..... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.02	0.03	0.33
Runoff, Q.....	cf	21	27	300

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-4051A**

Project: 111 Summer Street By WJH Date 5/11/2016

Location: Acton, MA Checked _____ Date _____

Circle one: Present | Developed
Circle one: Tc | Tt through subarea

Subcatchment P-3

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Woods			
2. Mannings roughness coeff., n (table 3-1)			0.6			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.036			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.23			0.23

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			UNPAVED			
8. Flow Length, L		ft	95			
9. Watercourse slope, s		ft/ft	0.014			
10. Average Velocity, V (figure 3-1)		ft/s	1.91			
11. Tt = L / 3600V	Compute Tt	hr	0.01			0.01

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.24
min 14.5

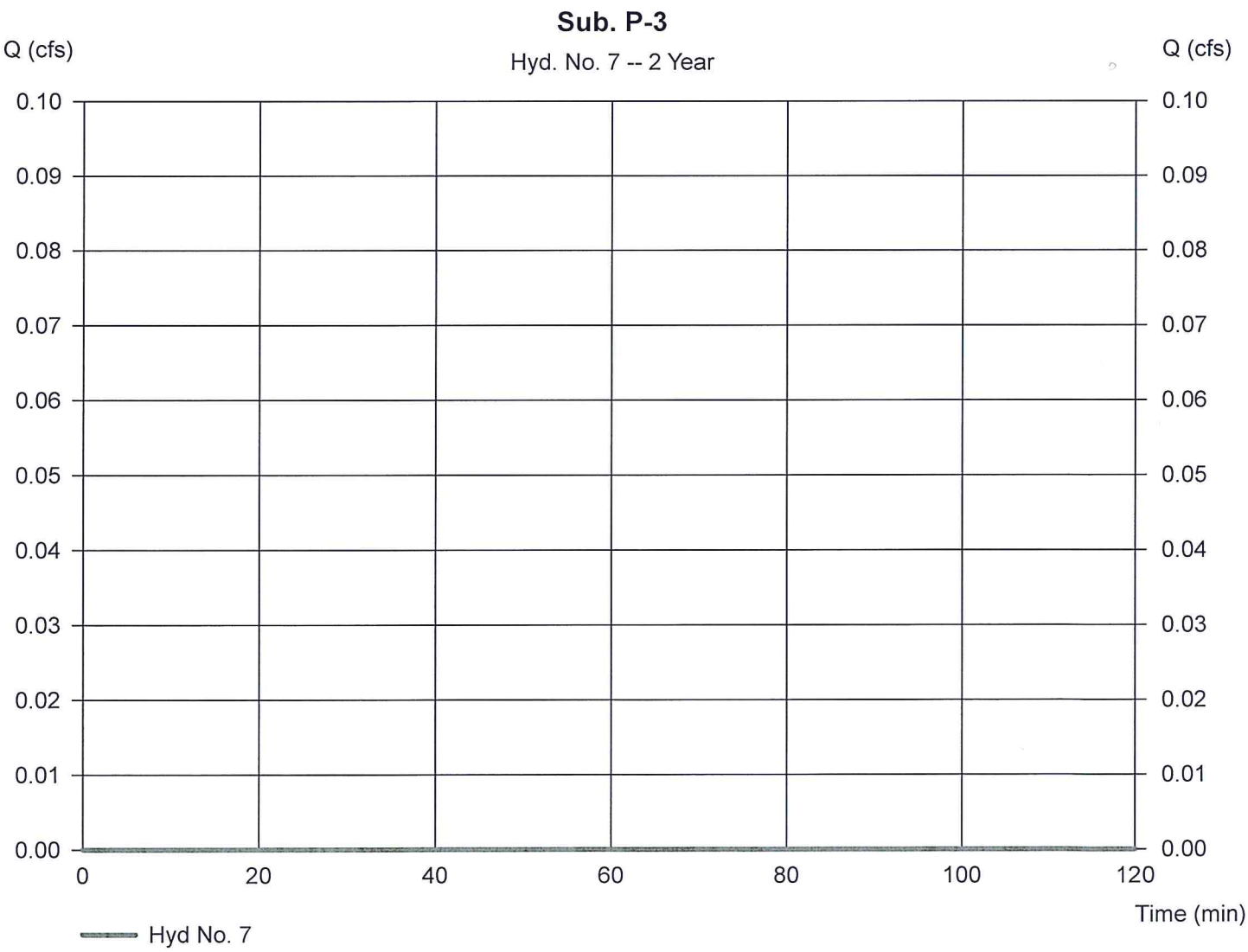
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 7

Sub. P-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Drainage area	= 0.250 ac	Curve number	= 34.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.50 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



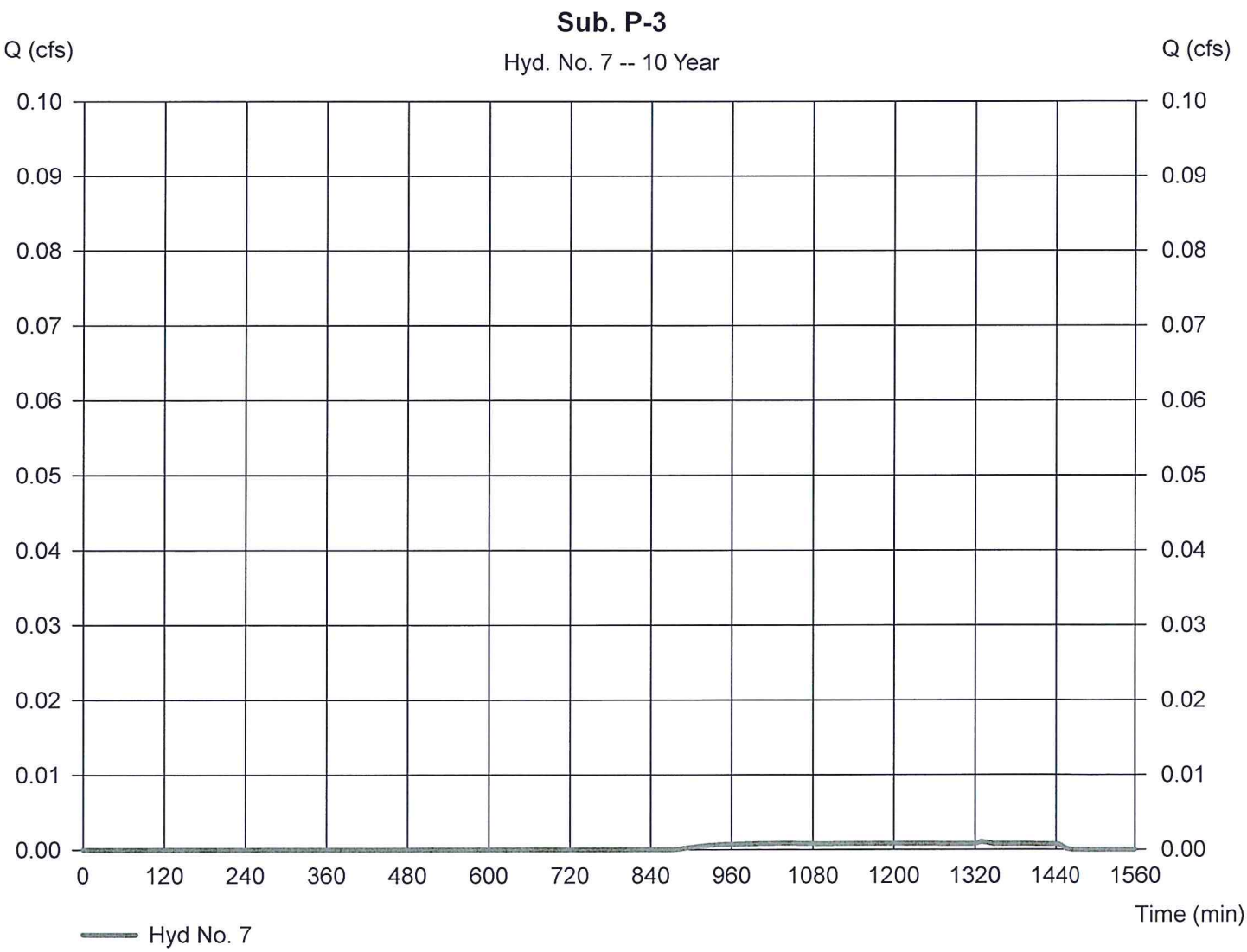
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 7

Sub. P-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.001 cfs
Storm frequency	= 10 yrs	Time to peak	= 1330 min
Time interval	= 2 min	Hyd. volume	= 26 cuft
Drainage area	= 0.250 ac	Curve number	= 34.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.50 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



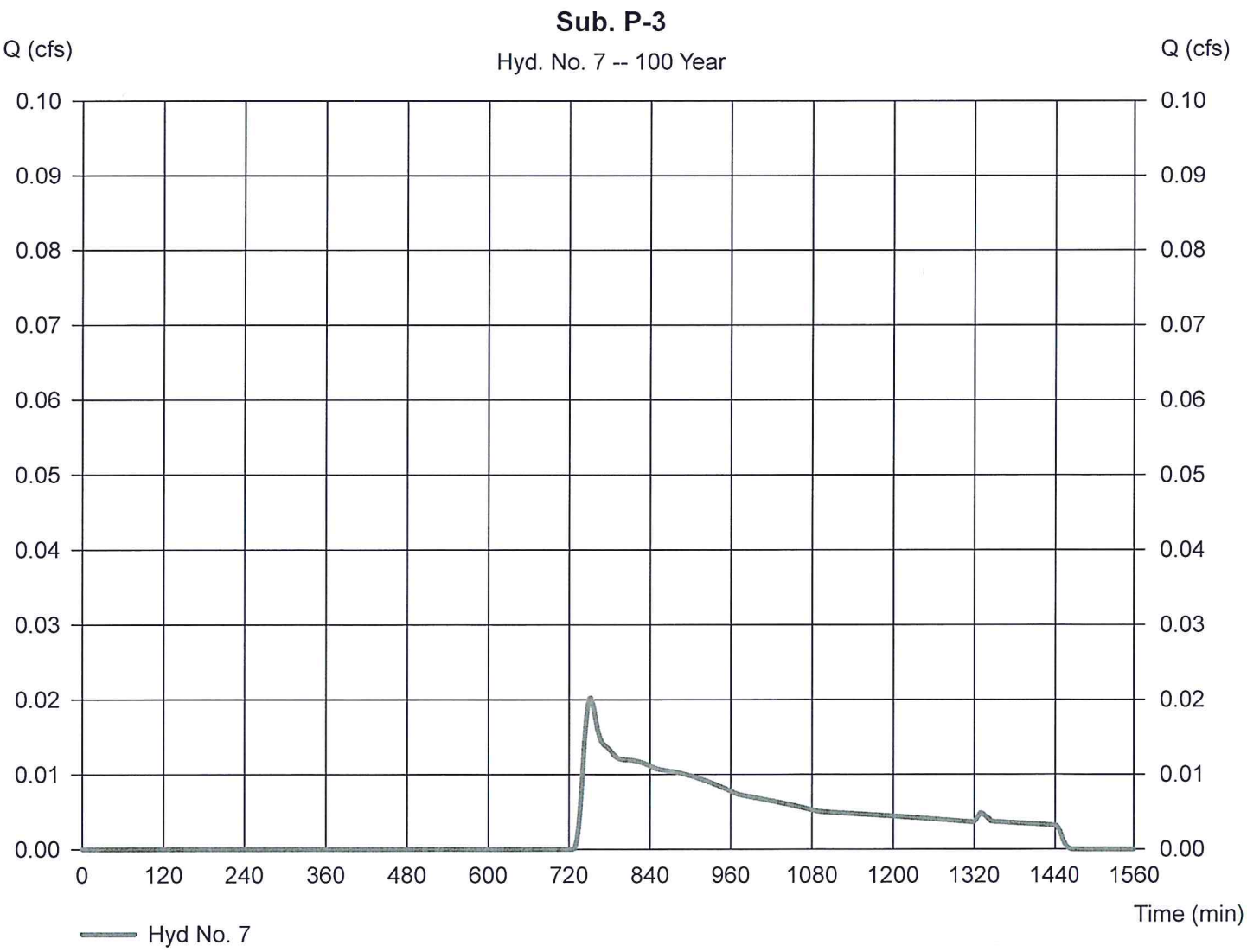
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 7

Sub. P-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.020 cfs
Storm frequency	= 100 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 291 cuft
Drainage area	= 0.250 ac	Curve number	= 34.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.50 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



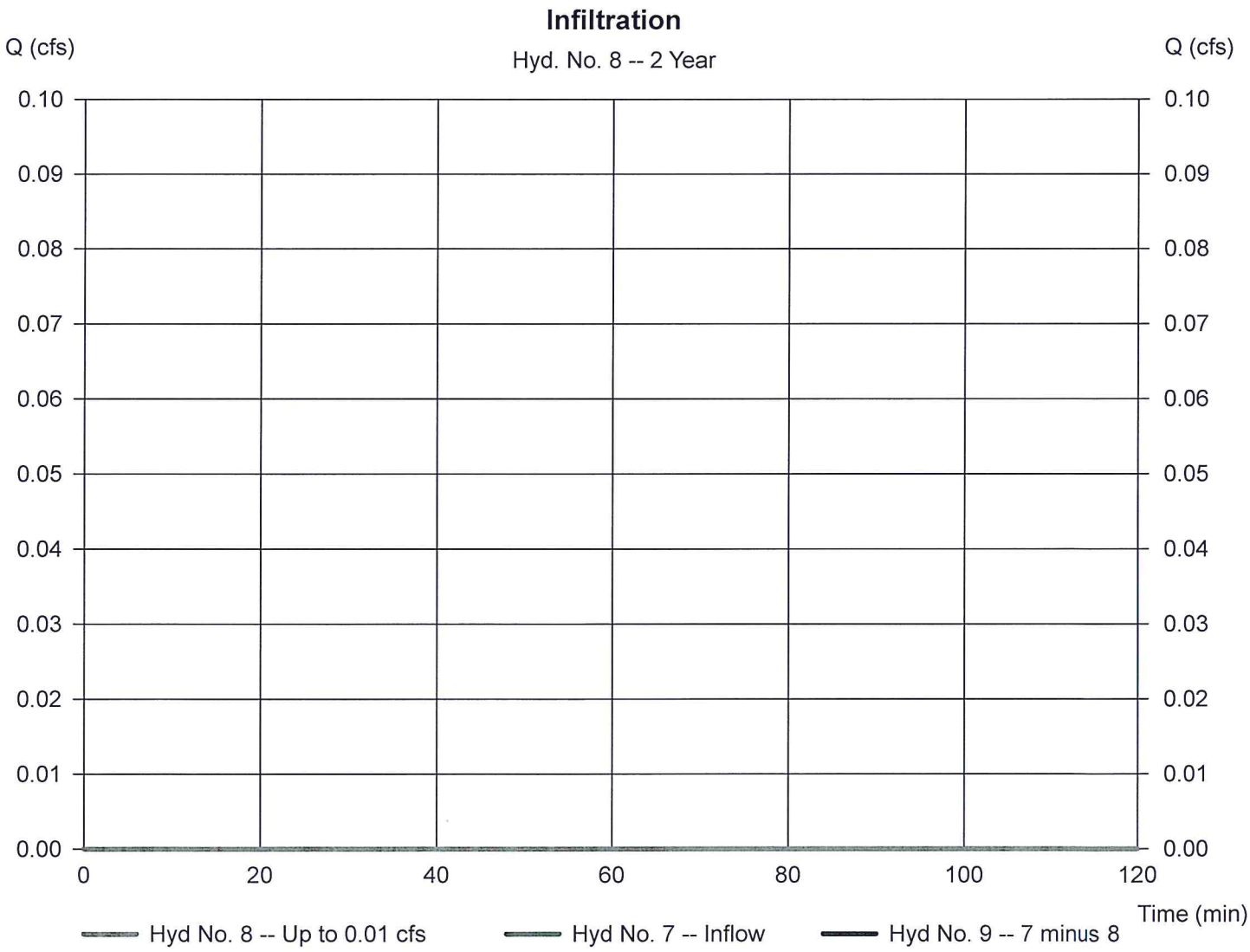
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Wednesday, May 11, 2016

Hyd. No. 8

Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 7 - Sub. P-3	2nd diverted hyd.	= 9
Diversion method	= Constant Q	Constant Q	= 0.01 cfs



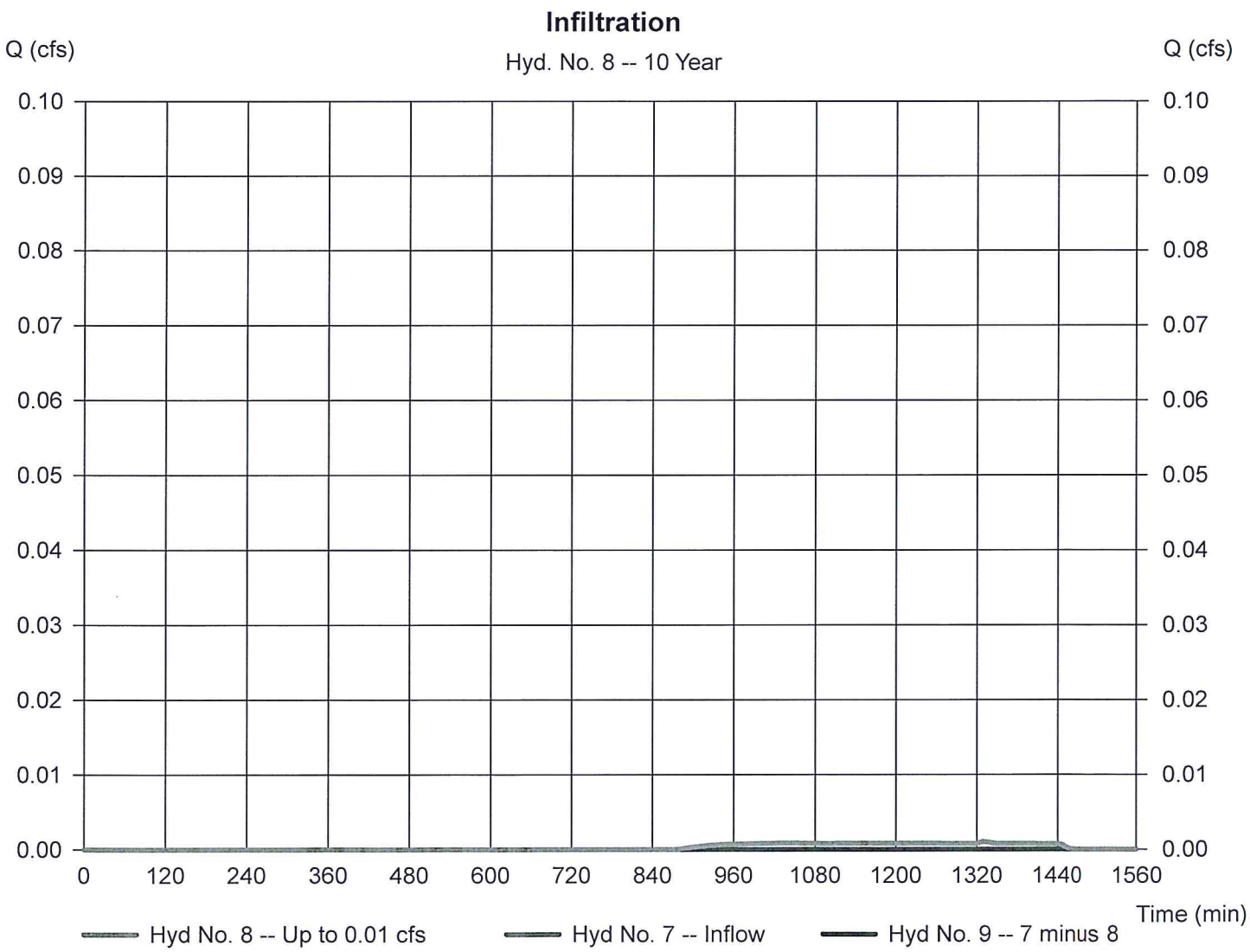
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 8

Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.001 cfs
Storm frequency	= 10 yrs	Time to peak	= 1330 min
Time interval	= 2 min	Hyd. volume	= 26 cuft
Inflow hydrograph	= 7 - Sub. P-3	2nd diverted hyd.	= 9
Diversion method	= Constant Q	Constant Q	= 0.01 cfs



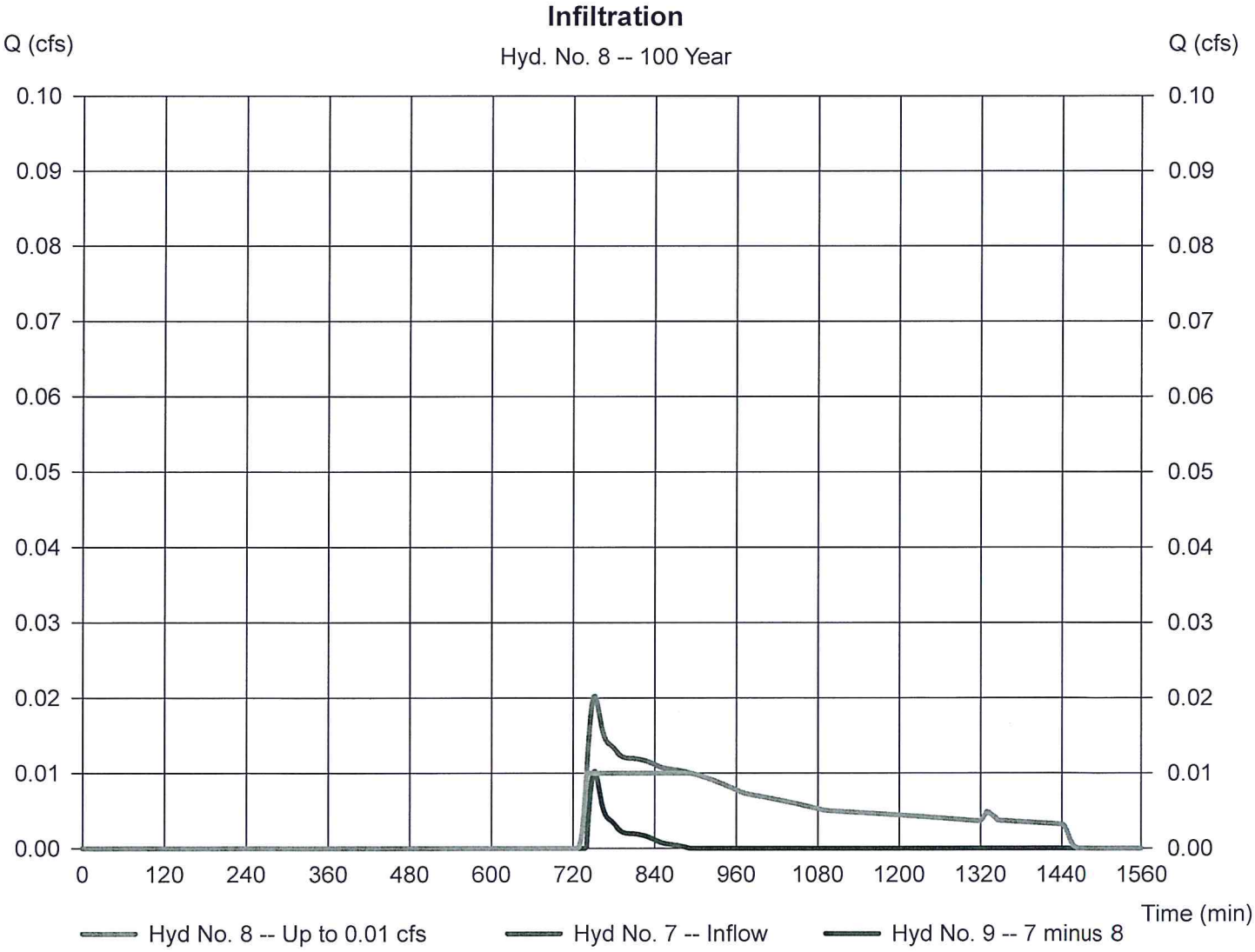
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 8

Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.010 cfs
Storm frequency	= 100 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 268 cuft
Inflow hydrograph	= 7 - Sub. P-3	2nd diverted hyd.	= 9
Diversion method	= Constant Q	Constant Q	= 0.01 cfs



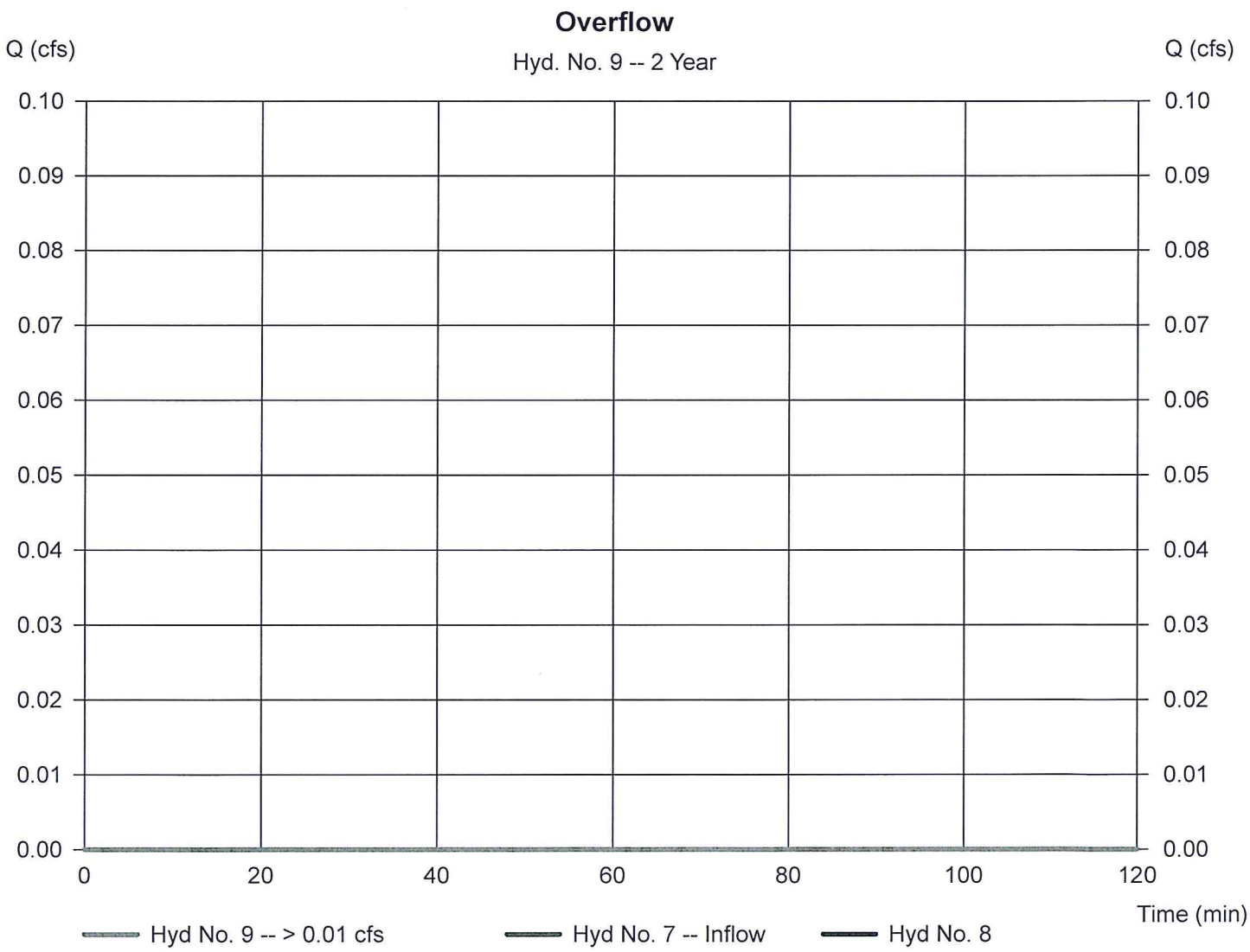
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Wednesday, May 11, 2016

Hyd. No. 9

Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 7 - Sub. P-3	2nd diverted hyd.	= 8
Diversion method	= Constant Q	Constant Q	= 0.01 cfs



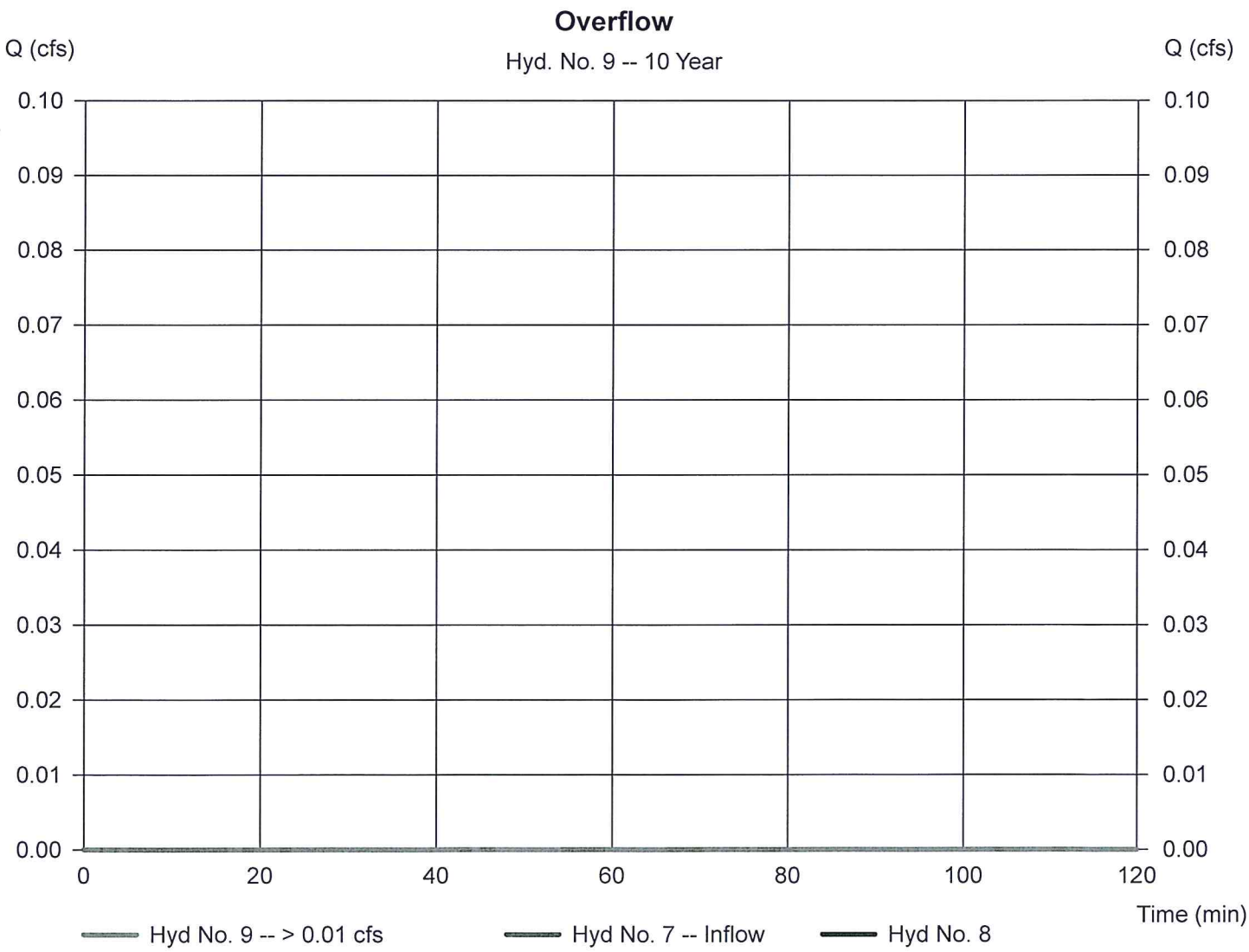
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 9

Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 7 - Sub. P-3	2nd diverted hyd.	= 8
Diversion method	= Constant Q	Constant Q	= 0.01 cfs



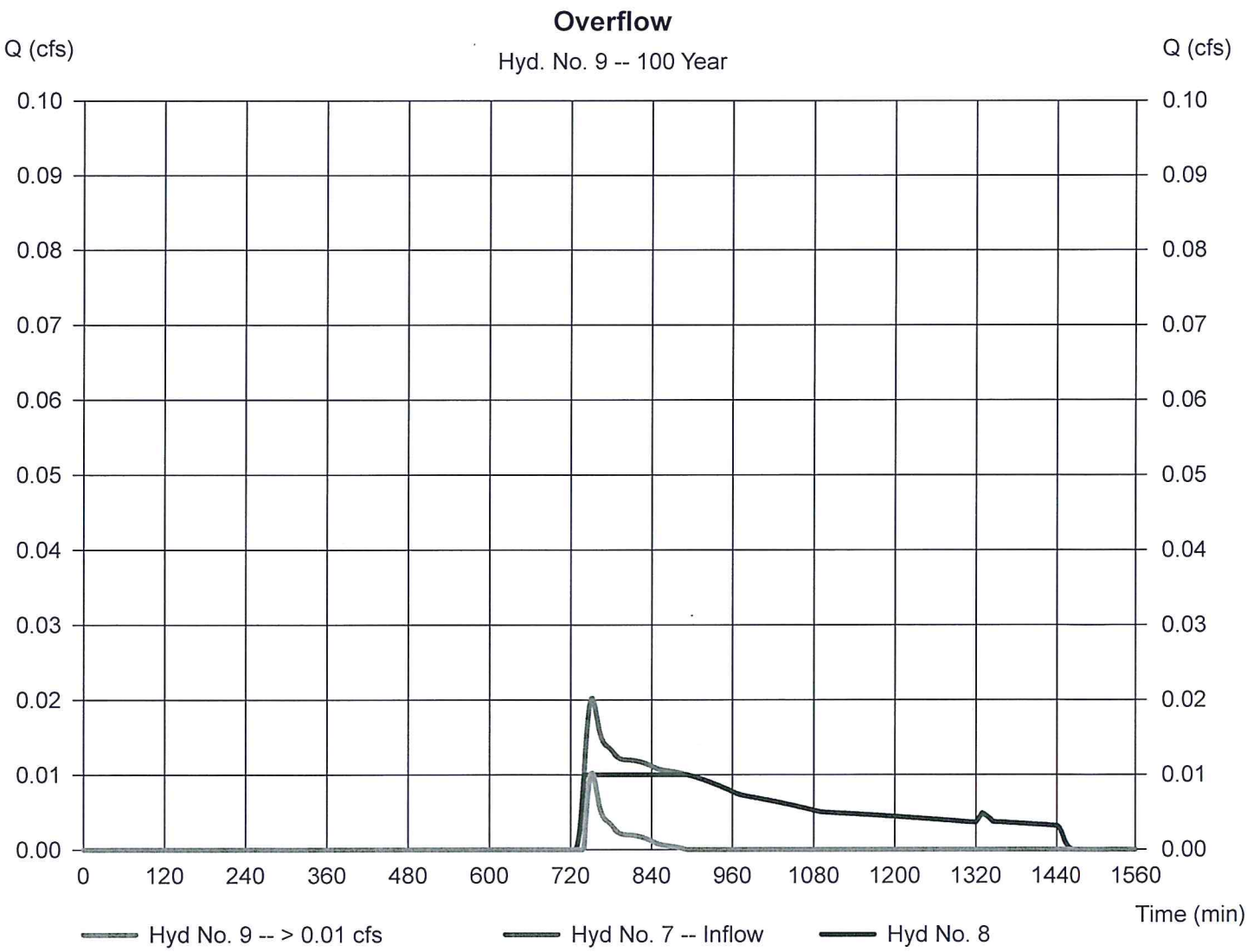
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Wednesday, May 11, 2016

Hyd. No. 9

Overflow

Hydrograph type	=	Diversion2	Peak discharge	=	0.010 cfs
Storm frequency	=	100 yrs	Time to peak	=	752 min
Time interval	=	2 min	Hyd. volume	=	23 cuft
Inflow hydrograph	=	7 - Sub. P-3	2nd diverted hyd.	=	8
Diversion method	=	Constant Q	Constant Q	=	0.01 cfs



Worksheet 2: Runoff curve number and runoff **SM-4051A**

Project: 111 Summer Street By WJH Date 5/11/2016

Location: Acton, MA Checked _____ Date _____

Circle one: Present [Developed] Subcatchment P-4

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
-	Impervious-Pavement	98			0.00	0.00
A	Open Space - Good Condition	39			0.31	12.14
A	Woods - Good Condition	30			0.30	8.96
				Totals =	0.61	21.10

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{21.10}{0.61} = 34.59$; Use CN = 34.6

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr	2	10	100
Rainfall, P (24-hour).....	in	3.1	4.5	6.4
Runoff, Q..... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.03	0.03	0.32
Runoff, Q.....	cf	56	58	705

D-2 (210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-4051A**

Project: 111 Summer Street By WJH Date 5/11/2016

Location: Acton, MA Checked _____ Date _____

Circle one: Present | Developed
Circle one: Tc | Tt through subarea

Subcatchment P-4

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Woods			
2. Mannings roughness coeff., n (table 3-1)			0.6			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.03			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.25			0.25

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			UNPAVED			
8. Flow Length, L		ft	50			
9. Watercourse slope, s		ft/ft	0.09			
10. Average Velocity, V (figure 3-1)		ft/s	4.84			
11. Tt = L / 3600V	Compute Tt	hr	0.00			0.00

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.25
min 14.9

(210-VI-TR-55, Second Ed., June 1986)

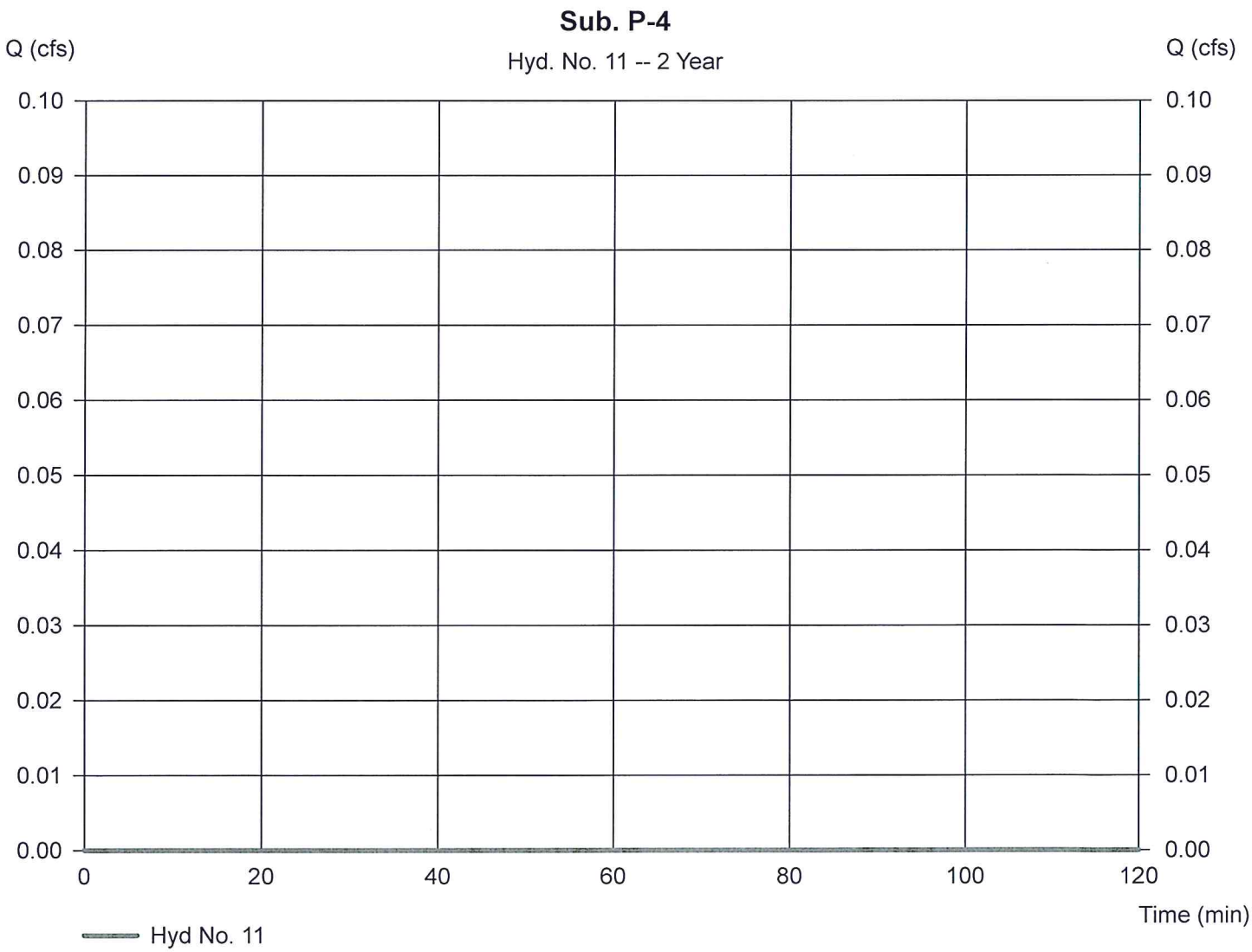
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 11

Sub. P-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Drainage area	= 0.610 ac	Curve number	= 34.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.90 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



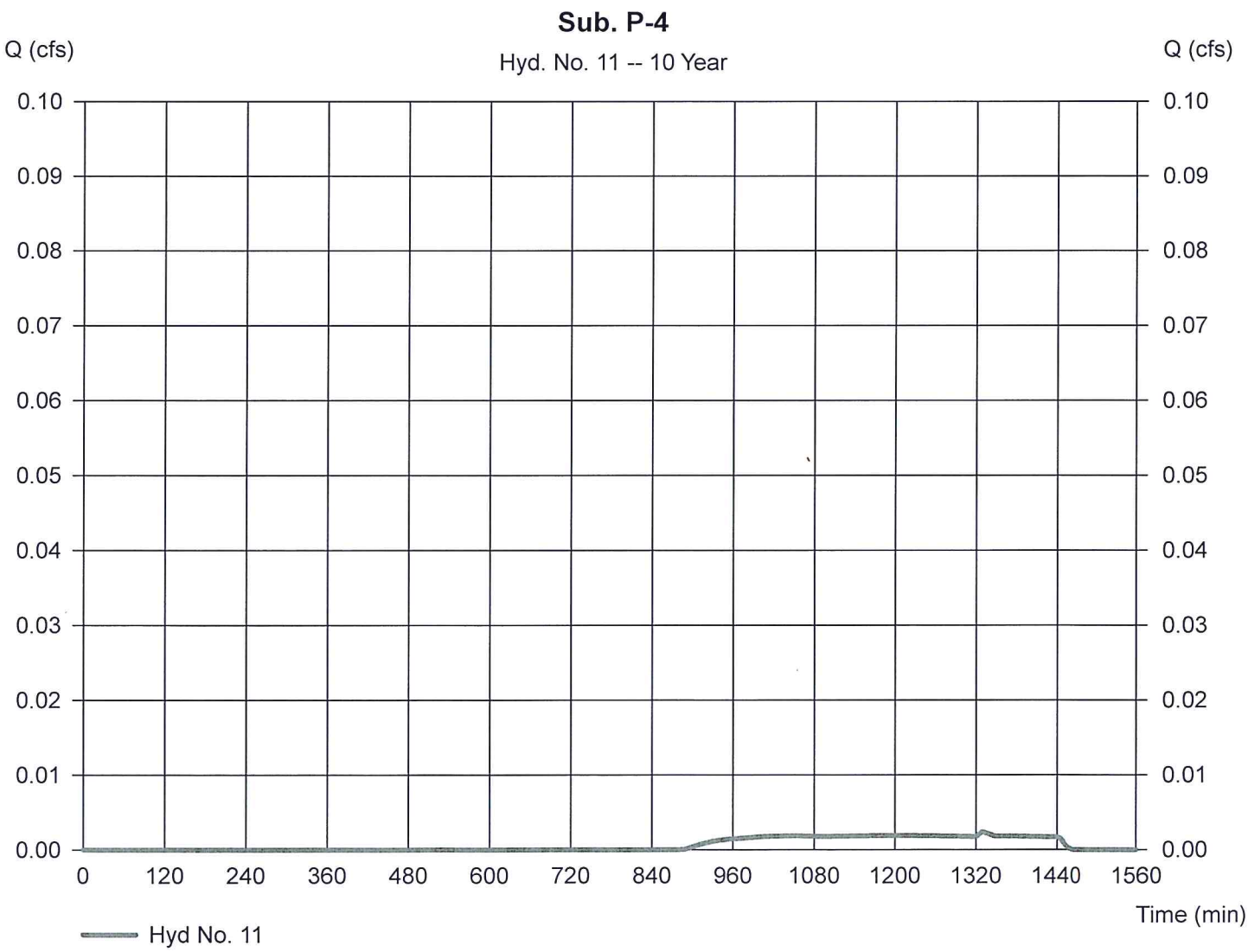
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 11

Sub. P-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.002 cfs
Storm frequency	= 10 yrs	Time to peak	= 1330 min
Time interval	= 2 min	Hyd. volume	= 57 cuft
Drainage area	= 0.610 ac	Curve number	= 34.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.90 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



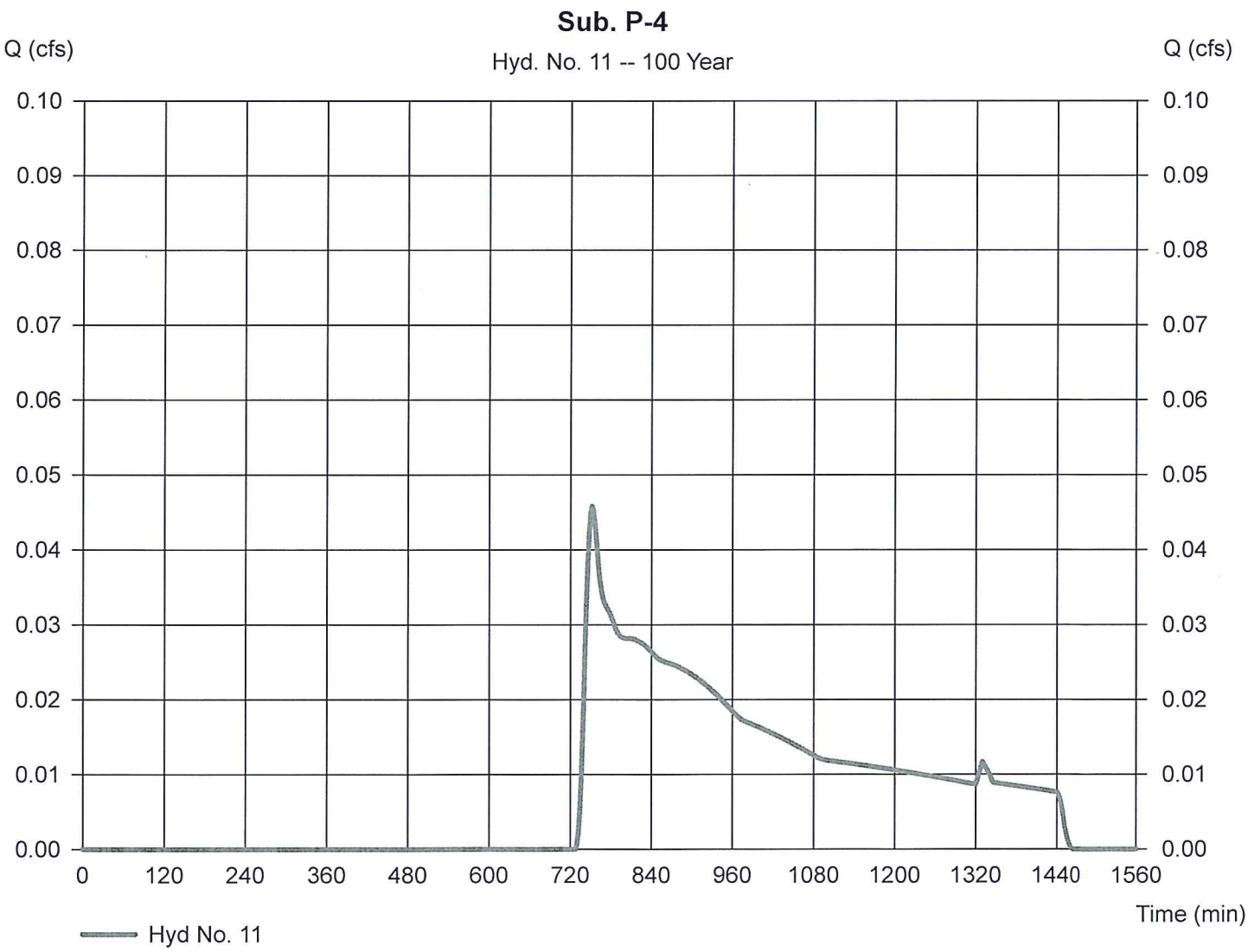
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 11

Sub. P-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.046 cfs
Storm frequency	= 100 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 688 cuft
Drainage area	= 0.610 ac	Curve number	= 34.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 14.90 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



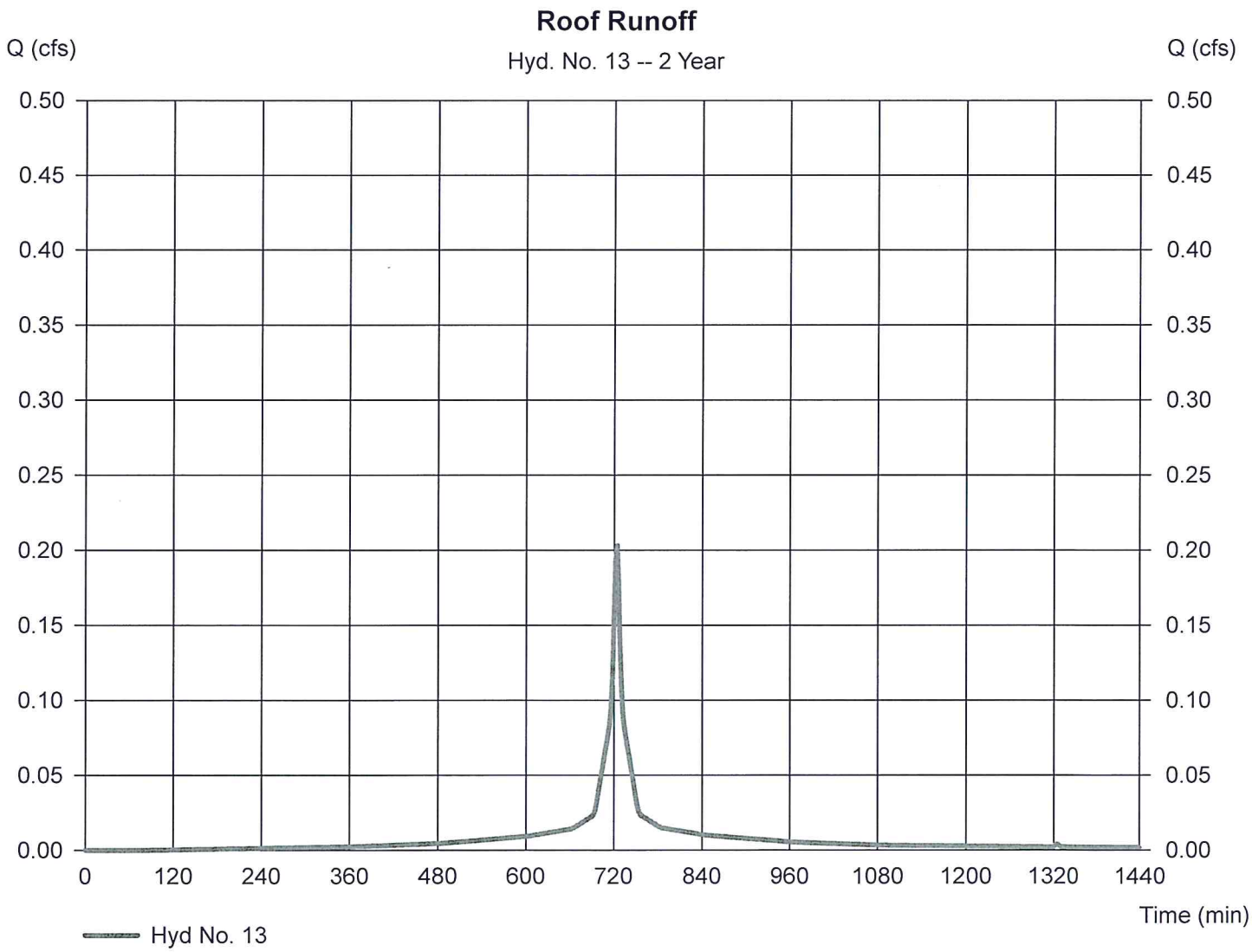
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Wednesday, May 11, 2016

Hyd. No. 13

Roof Runoff

Hydrograph type	= SCS Runoff	Peak discharge	= 0.203 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 683 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



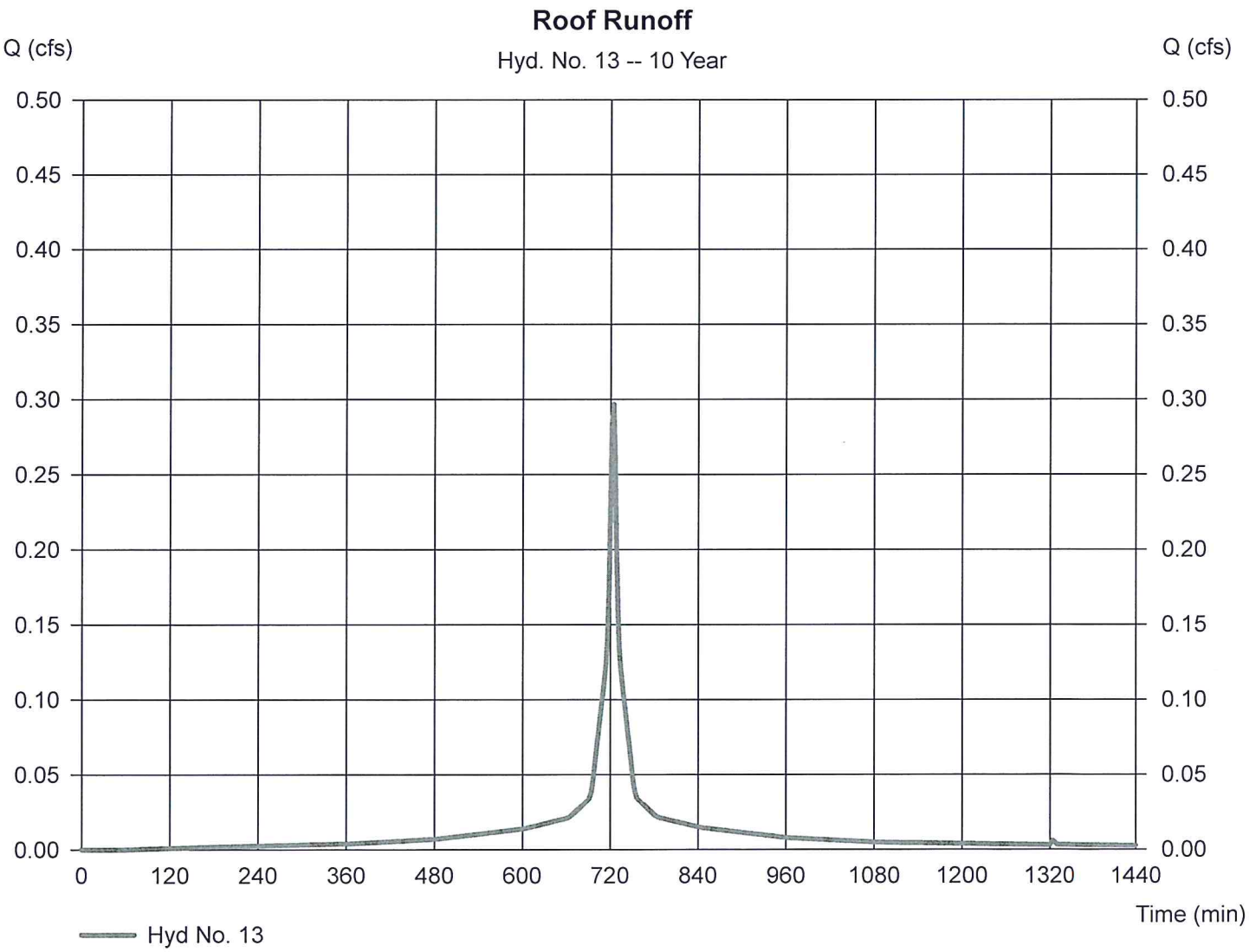
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Wednesday, May 11, 2016

Hyd. No. 13

Roof Runoff

Hydrograph type	= SCS Runoff	Peak discharge	= 0.297 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 1,016 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



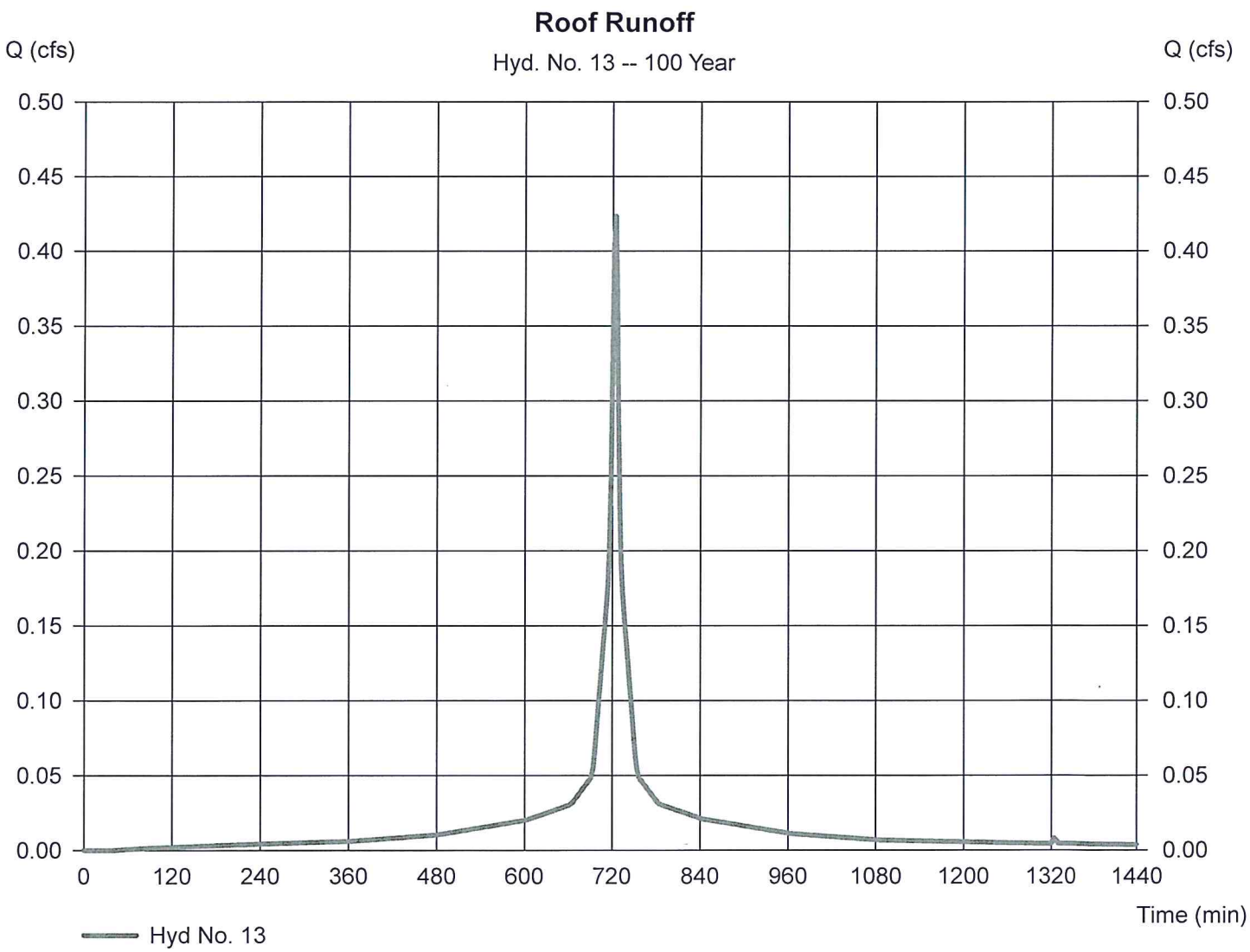
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 13

Roof Runoff

Hydrograph type	= SCS Runoff	Peak discharge	= 0.423 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 1,468 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

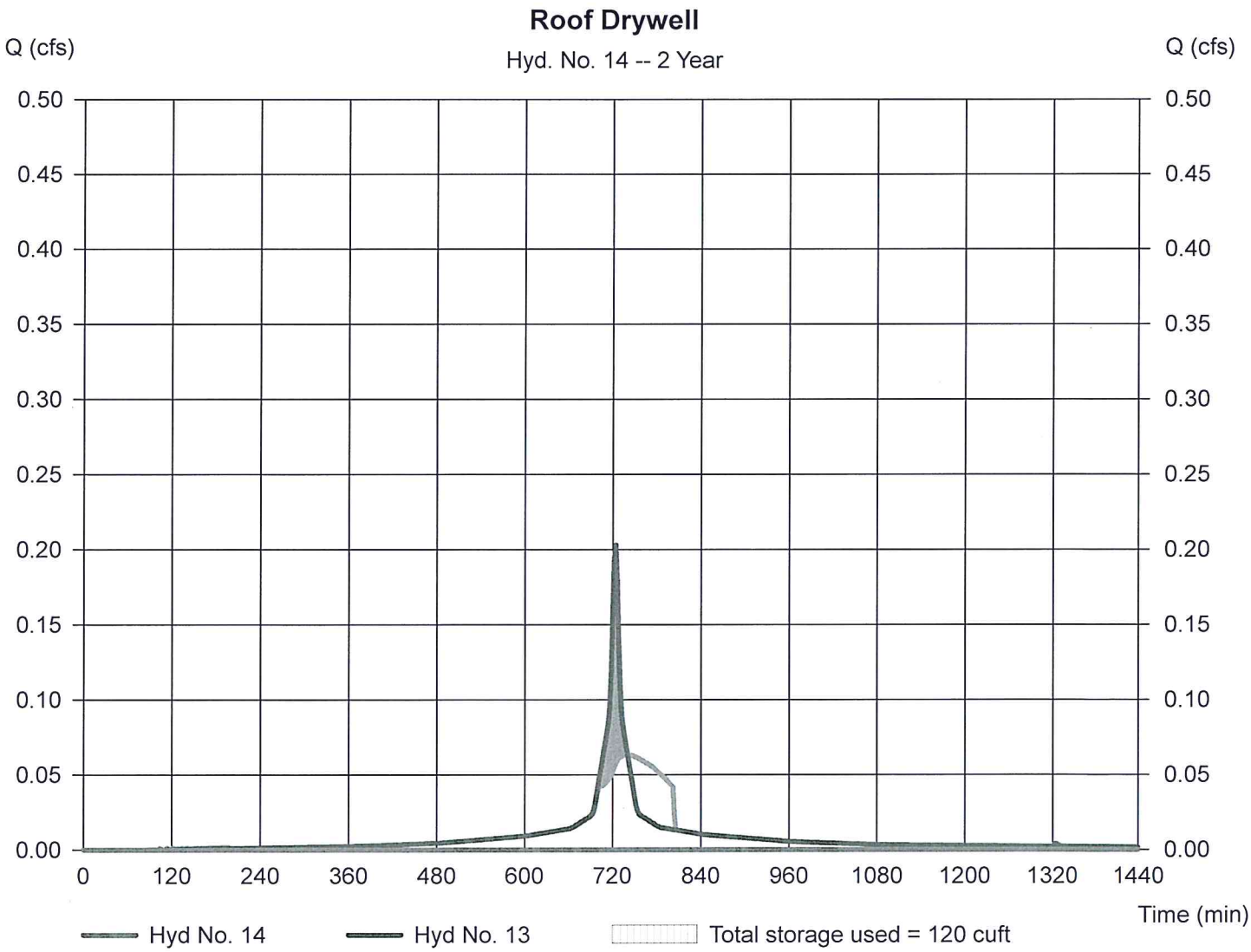
Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 14

Roof Drywell

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 690 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 13 - Roof Runoff	Max. Elevation	= 218.40 ft
Reservoir name	= Roof Drywell	Max. Storage	= 120 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

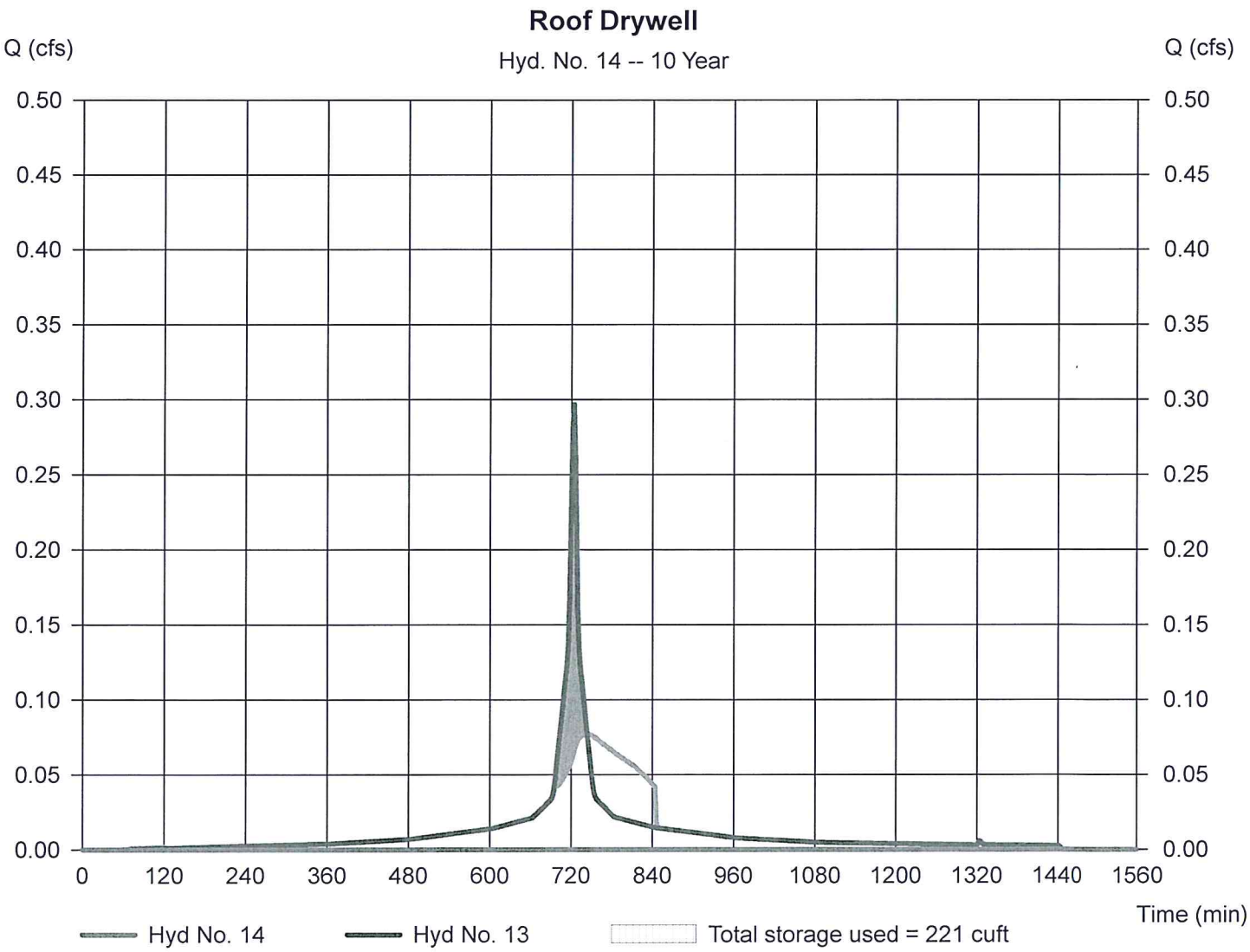
Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 14

Roof Drywell

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 680 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 13 - Roof Runoff	Max. Elevation	= 218.97 ft
Reservoir name	= Roof Drywell	Max. Storage	= 221 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

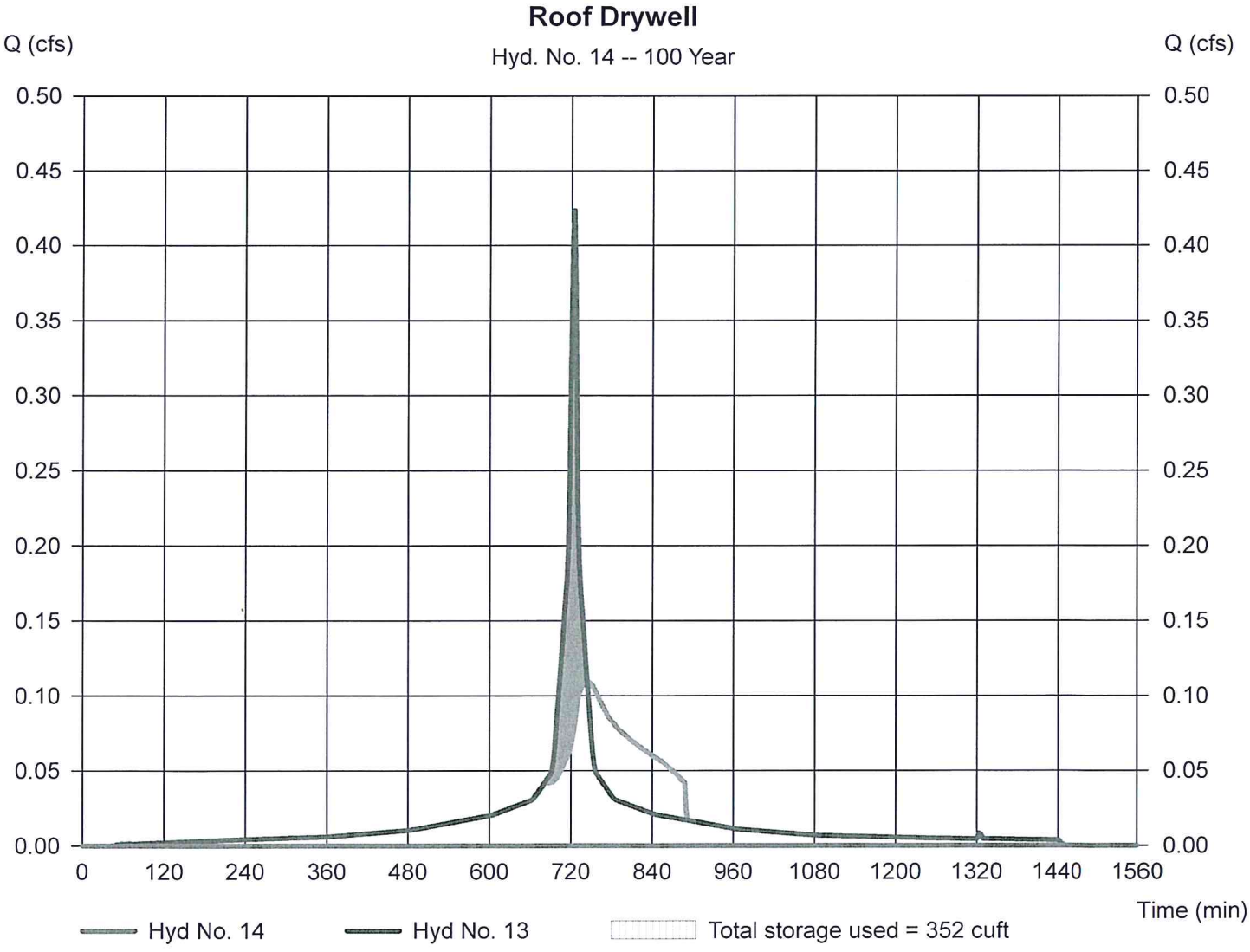
Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Hyd. No. 14

Roof Drywell

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 622 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 13 - Roof Runoff	Max. Elevation	= 220.29 ft
Reservoir name	= Roof Drywell	Max. Storage	= 352 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Pond No. 2 - Subsurface Infiltration

Pond Data

UG Chambers - Invert elev. = 215.00 ft, Rise x Span = 1.33 x 2.83 ft, Barrel Len = 39.16 ft, No. Barrels = 6, Slope = 0.00%, Headers = No
Encasement - Invert elev. = 214.00 ft, Width = 4.00 ft, Height = 3.33 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	214.00	n/a	0	0
0.33	214.33	n/a	125	125
0.67	214.67	n/a	125	250
1.00	215.00	n/a	125	376
1.33	215.33	n/a	256	632
1.67	215.67	n/a	248	880
2.00	216.00	n/a	228	1,108
2.33	216.33	n/a	185	1,293
2.66	216.66	n/a	125	1,419
3.00	217.00	n/a	125	1,544
3.33	217.33	n/a	125	1,669

Culvert / Orifice Structures

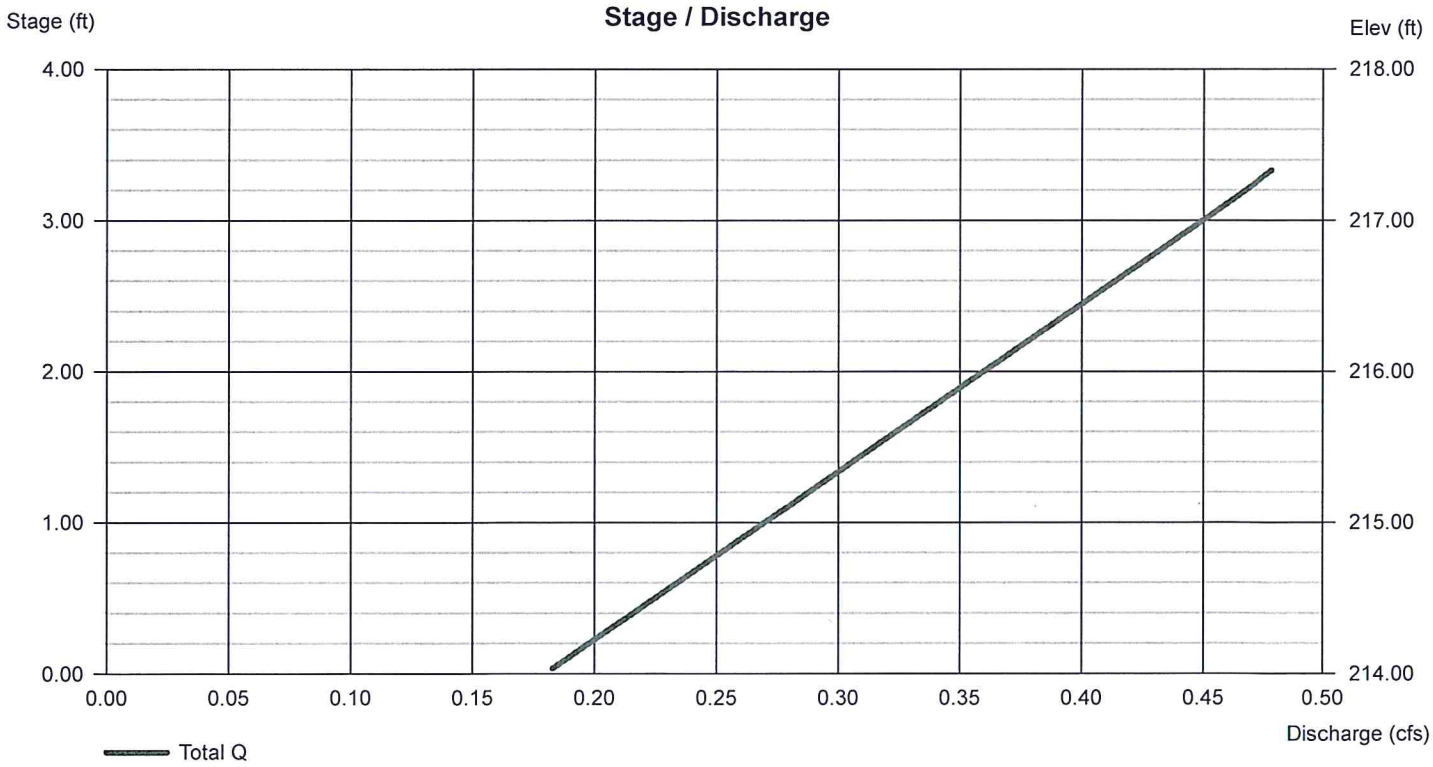
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 8.270 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Hydraflow Hydrographs by Intelisolve v9.2 — Wednesday, May 11, 2016

Pond No. 3 - Roof Drywell

Pond Data

UG Chambers - Invert elev. = 218.00 ft, Rise x Span = 1.33 x 2.83 ft, Barrel Len = 32.04 ft, No. Barrels = 2, Slope = 0.00%, Headers = No
Encasement - Invert elev. = 217.50 ft, Width = 3.33 ft, Height = 3.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	217.50	n/a	0	0
0.30	217.80	n/a	26	26
0.60	218.10	n/a	36	62
0.90	218.40	n/a	58	120
1.20	218.70	n/a	55	175
1.50	219.00	n/a	51	226
1.80	219.30	n/a	41	267
2.10	219.60	n/a	26	293
2.40	219.90	n/a	26	319
2.70	220.20	n/a	26	344
3.00	220.50	n/a	26	370

Culvert / Orifice Structures

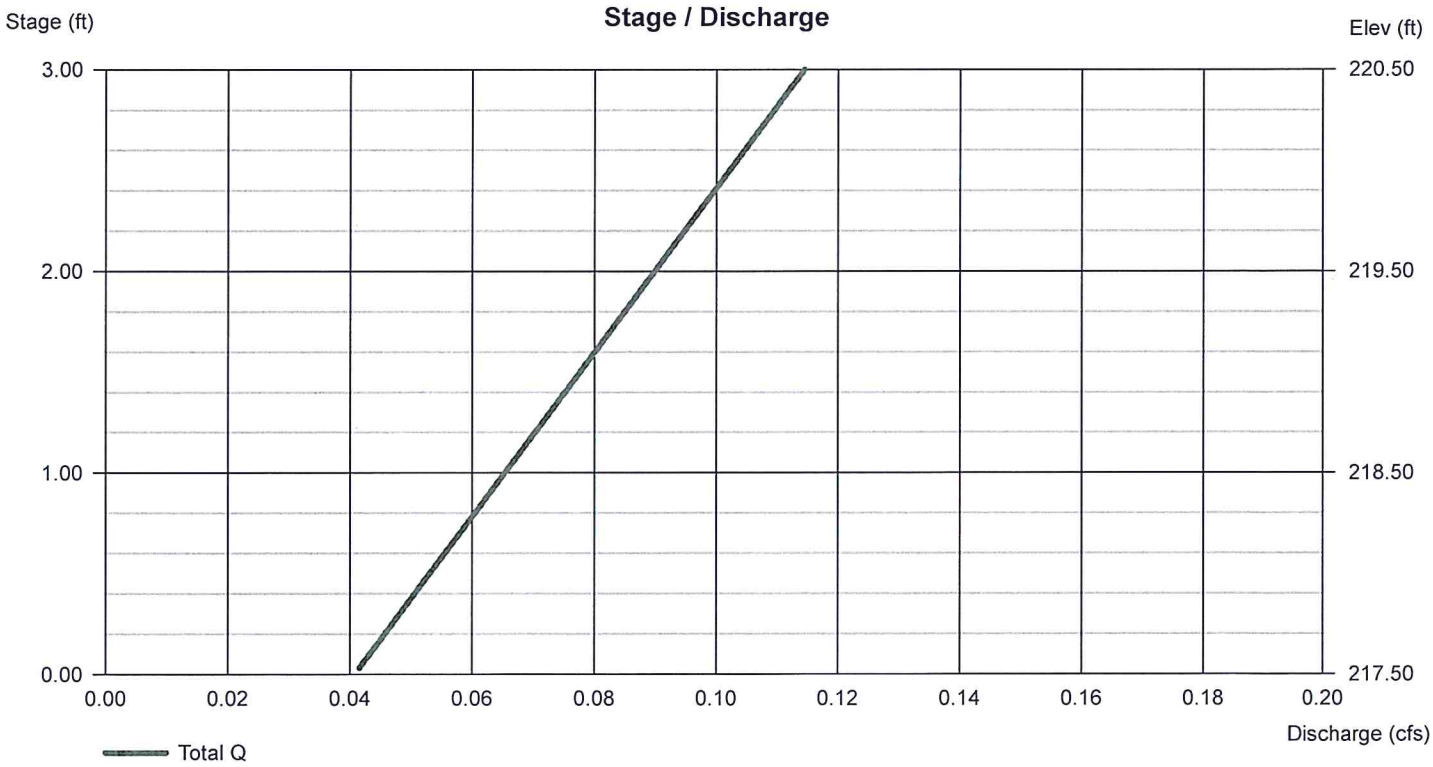
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 8.270 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Infiltration Trench Calculation

Project: 111 Summer Street by: WJH Date: 1/7/2016

Location: Acton, MA checked: Date:

Infiltration Trench Sizing

Length:	50	ft
Depth:	2	ft
Width:	1	ft
Bottom Area:	50	SF
Sidewall Area:	204	SF
Total Area:	254	SF
Infiltration Rate:	8.27	in/hr
	0.000191	ft/sec
Q=	0.049	CFS

Recharge Volume Calculations